

INDUSTRIAL RESEARCH

1947

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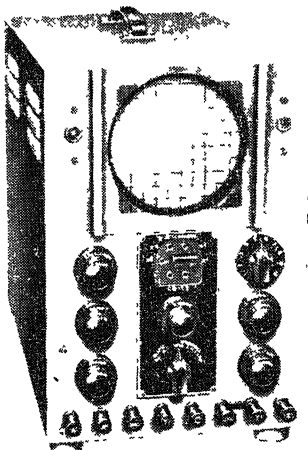
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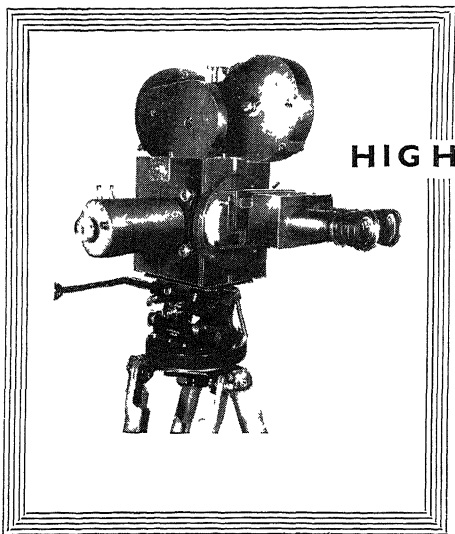
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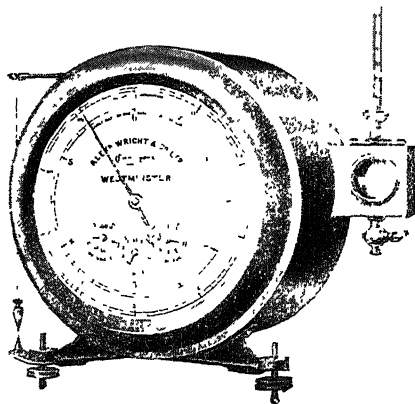
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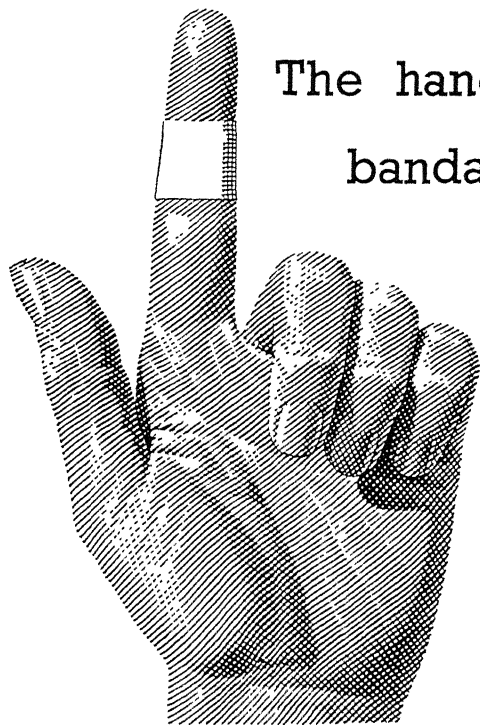
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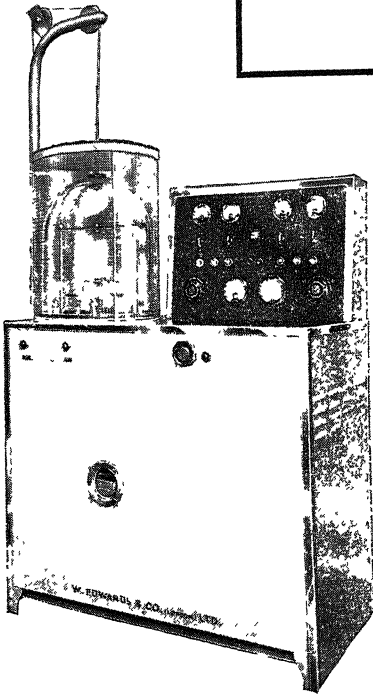
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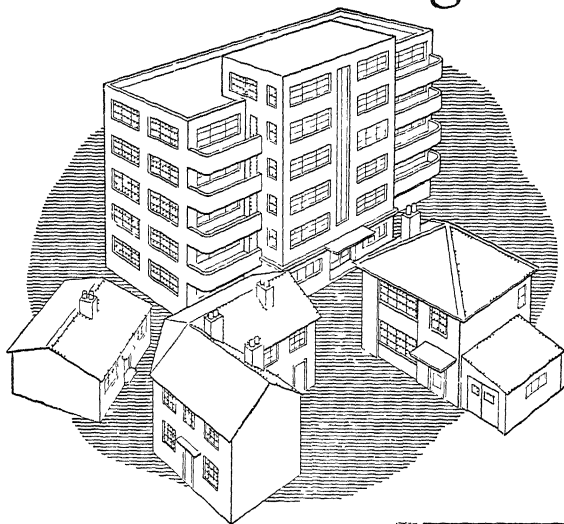


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Keratin, the unique protein substance from which the wool fibre is formed, has been examined by the methods of classical organic chemistry and physics, while recently the newer weapons of X-ray diffraction and the electron microscope have been brought to bear on it. Fundamental work on its thermal conductivity, water repellency and the mechanism of water vapour absorption have been pursued. On the technical side, research has influenced the development of new machinery and suggested improvements in processing methods.

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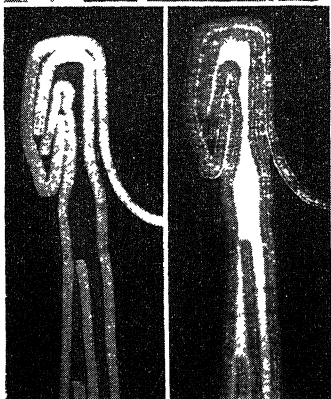
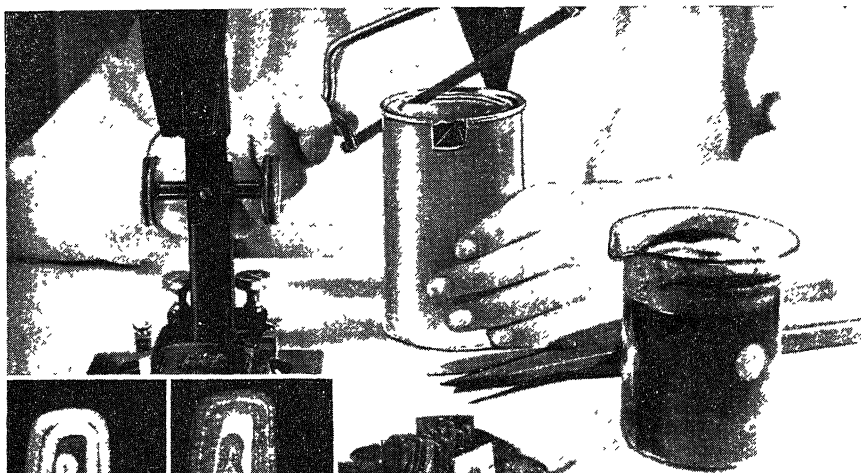
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Science behind the can



LEFT shows seam prepared in the usual way in which it is difficult to distinguish between dead space and solder

RIGHT shows seam etched by the Metal Box process in which the dead space is shown black, the solder white and the tinplate grey.

Scientific study of all the processes involved in the manufacture of a food can is to a great extent responsible for its remarkably high protective qualities

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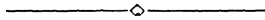
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THE BRITISH GAS COUNCIL, 1, GROSVENOR PLACE, S.W.1

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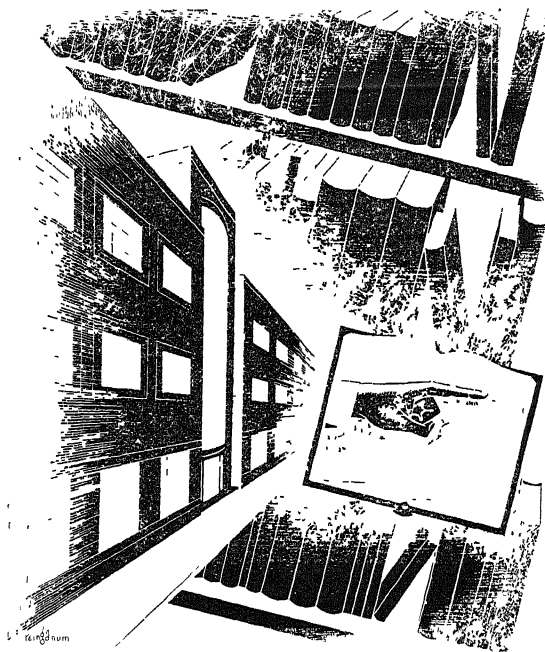
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NICKEL RESEARCH

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PUBLISHERS' FOREWORD

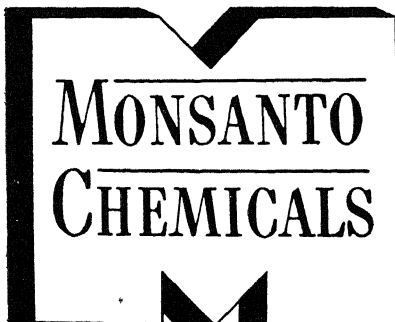
THE field of industrial research is ever expanding, and a reference book covering this vital subject must necessarily increase its scope with each new edition. This second edition of INDUSTRIAL RESEARCH will accordingly be found to embody several entirely new sections and much fresh information, while all existing sections have, of course, been completely revised and brought up to date. New sections added are : A "Directory of Consultants" and a section on Technical Colleges, embodying the Report of the Federation of British Industries ; also the article on "Careers" contains a new appendix on grants available for Industrial Research. With the passing of wartime security restrictions, too, it has become increasingly possible to give details of research work being carried out by individual firms, and full advantage has been taken of this circumstance. Another interesting feature of the present edition is that the recommendations on research of the various Working Parties of the Board of Trade have been summarised and will be found in the Committee Section. Brief particulars are also given of Research associations formed in the intervening year since the publication of our last edition.

In the compilation of this volume our warm thanks are due to our Advisory Editor, Dr. Percy Dunsheath, C.B.E., whose guidance has been most valuable. We also thank the many Government Departments—in particular the Department of Scientific and Industrial Research, the Dominions offices and the various research institutions too numerous to mention—for their generous collaboration without which this book could not have been produced. We are greatly indebted to Dr. B. J. A. Bard, Head of the Industrial Research Secretariat, and to Mr. O. F. Brown of the D.S.I.R. for their co-operation, valued criticism and ungrudging assistance which have been of immense value.

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INTRODUCTION

BY THE ADVISORY EDITOR

NO apologies are needed for the appearance of this second edition of the Research Year Book. The first edition, in itself an experiment, proved an unqualified success; it met a real need in a new and rapidly developing field by bringing together in one volume a mass of information relating to scientific and industrial research never before available in an ordered form.

As was to be expected of a first edition, in such a new and specialised sphere, perfection was not reached either in the arrangement or in the matter covered; the preparation of a new edition has provided opportunities for improvements in both. Moreover, the hothouse developments of the past few years and the general release of information following the end of the war have now made it possible to include in the contents of the book certain new matter hitherto excluded. This will be appreciated not only by numerous subscribers who were unable to obtain copies of the limited first edition but also by many who, while possessing the previous edition, will wish to have available the latest information in the different branches of the subject.

The whole field of industrial research is at the present moment undergoing an interesting metamorphosis which will result in a rapid gain in effectiveness. The organisation of the work and the training and employment of suitable personnel are subjects of great current interest and importance, while the attitude of the industrial leader shows that he appreciates the possibilities inherent in an extension of the scientific approach to all his problems.

In conferences such as that held in the spring of 1946 in London by the Federation of British Industries under the aegis of its Research Committee and the one held in Manchester in the autumn by the Chamber of Commerce Joint Research Council, many fundamental problems were ventilated for the first time. Opportunities were also taken on both these occasions to review progress and to bring before a wider public many aspects which were previously appreciated in only a limited circle.

Theoretical platitudes which have been current for the past twenty years are being rapidly replaced by practical conceptions and techniques. Difficulties formerly glossed over are being faced in a spirit of reality and workable solutions found, thanks to the closer co-operation now obtaining between the university scientist and the business man. Naturally these solutions are frequently the result of compromises, as for example in the development of scientific research for the smaller firms. The important discussions in London and Manchester have demonstrated that even where the firm is much too small to contemplate setting up a research laboratory or even the employment of a highly scientific staff, it can do much to inform itself on the progress of scientific knowledge and to apply the knowledge as it becomes available to the improvement of its processes and products.

It has been our object to place before all those interested a collection of up-to-date information conveniently arranged for reference and as accurate as possible. In achieving this aim, we trust that the interests of the university, the service departments and of industry have been provided for as well as those of workers whether in laboratory or consultant's office.



Sir Edward Appleton, G.B.E., K.C.B.,
M.A., D.Sc., LL.D., F.R.S.
Secretary of the Department of Scientific and Industrial Research

Progress in Industrial Research 1946—47

Basil J. A. Bard, Ph.D., B.Sc., Barrister at Law.

Head of the Industrial Research Secretariat of the Federation of British Industries

INTRODUCTION. The eighteen months since VJ Day constitute the first and more difficult half of the transition stage from war to peace. They have seen an intense and sustained interest in almost every aspect of scientific and technical research for industry, no less than in the larger question of science in relation to civilisation. There are many good reasons for this interest. The accumulative effort of more scientific education, both academic and popular, is at last being felt. The value of the achievements of science in the world war just concluded, culminating in the atom bomb itself and the hopes and fears for the future that it carried within its devastating wake, has been brought home to the man in the street. But most of all, perhaps, there is a steadily growing realisation that the extent to which research for industry is carried out and applied is a significant, possibly a determining, factor in the country's economic survival. The national frame of mind as it appeared to manifest itself at the beginning of the transition period can be summed up as: "We know science has done mighty things in the war; will it play its full part in winning the peace? Is industry sufficiently research-minded to carry out investigations on the scale that the needs of the time demand? Still more, is industry sufficiently research-minded and are economic, taxation and business conditions sufficiently favourable to be certain that the results of research are published fully and applied promptly and efficiently for industrial progress? Is our overall national organisation of research adequate? Are the existing facilities for research sufficient in quality, size and character to meet the diverse needs of industry?" Many of these questions have received at least an interim answer in the last 18 months.

RESEARCH-MINDEDNESS. There is a very keen and intense demand by industry for research scientists, for laboratory buildings, and for the provision of scientific equipment and instruments, coupled with a special interest in those aspects of industrial management which relate to the organisation of an industrial research department, its relationship with the other departments of the business, and with research facilities outside the business. Especially is there a keen demand that the means and technique whereby the results of research, wherever it may have been carried out, can be speedily brought within the ken of those whose job it is to apply them to the purposes of production. This is not to say that all industry is 100 per cent. research-minded or that science has completely pervaded and permeated industry. It is true, however, that industrial research in Great Britain is a flourishing and vigorous growth capable of healthy expansion when material and staff deficiencies can be overcome. At the present rate of progress of the growth of research-mindedness in industry, it is probable that these demands will continue to outstrip available supplies

on an increasing scale. This is now resulting in a close and critical examination of the various industrial research resources to ascertain whether they are playing the most useful possible role in the present period of acute scarcity, and whether our educational establishments cannot, while maintaining and, if possible, enhancing the quality of trained scientists, increase their output. An important question too, is whether there is a proper balance and distribution of skilled research workers.

The part the Government can play in fostering and promoting research for industry has been given serious attention and widespread action has resulted. This has included the expansion of the Department of Scientific and Industrial Research itself, and the work it carries on at establishment of scientific sections in other Government Departments ; the setting up of industrial working parties, some of whom have now reported ; the granting of large sums of money (large both relatively and absolutely) to the universities ; complete remission of taxation in respect of research expenditure by industry, and a close examination of the use of the operational research technique and approach developed during the war to see how far it is valid for peacetime activities. Further, in the last few months, the appointment of a special council under the chairmanship of Sir Henry Tizard to advise the Government on its scientific policy has been announced.

RESEARCH FACILITIES. The industrial research activities and facilities in Great Britain today are greatest in variety and diversity, if not in size, of any to be found in any country in the world. They include the research laboratories and departments of a large and increasing number of private firms (probably of the order now of a little under 1,000) which themselves differ from one another in organisation and set-up ; about forty industrial co-operative research associations (the vast majority of which are partly supported by Government financial grants) ; the research stations of the D.S.I.R. and several other Government Departments ; about half a dozen development associations ; a number of universities and technical colleges ; some independent, privately endowed laboratories and a considerable number of private consultant groups.

Research is also organised by a fair number of professional bodies and institutions. The overall annual expenditure on industrial research in the country probably amounts to close on one per cent. of the value of industry's annual production.

Furthermore, on any current industrial problem, it can be said with a good deal of truth, either that information as to the solution exists and can be located by one who knows his way around the publication and library world, or that there is some research organisation in the country working on, or prepared to work on, this particular problem. The difficulty of putting the industrial inquirer in touch with the appropriate facilities that can best help him, is being increasingly recognised ; it requires a skilled intermediary familiar with the various research establishments and their actual and potential activities.

INDUSTRIAL RESEARCH IN RELATION TO OUR ECONOMIC SURVIVAL. The fuel and industrial crisis in the early months of 1947 drew sharp attention to the part that science can play in liberating the country from its present unhappy economic condition by its reaction on the character and amount of our exports, the efficiency and output of industry, the continuance of full employment, and the maintenance of our standard of living. As was

said by Sir William Larke at the F.B.I. Conference on Industry and Research in March 1946 :

“ In the drive for increased production on which our economic survival depends, and in our efforts to increase the volume of our exports to pay for those imports on which the operation of our industries is dependent, it follows that we cannot rely on expanding our exports of commodities of ordinary consumption which are produced with equal efficiency in countries now able to supply themselves but which were previously open to us as export markets. We must therefore develop and expand our export trade in products of industries in which the results of recent scientific research are embodied. To these industries we must look for the greatest possible increase in exports in order to compensate for the loss of markets in those industries affected by the new order of competition. Some of the industries on which a particular responsibility will rest are the Engineering and Chemical groups, the newer Textiles (based on synthetic fibres) and those older industries which, based originally on empiricism, have improved and still are improving their products and their practice by the adoption of scientific research and the application of the scientific method. It should be noted that even those industries which by the nature of their products may expect to meet keen competition, can, and doubtless will, by the intensive application of research, so improve or even change the character of their products as to establish a new competitive position in world markets.”

THE GOVERNMENTAL ORGANISATION OF INDUSTRIAL RESEARCH IN GREAT BRITAIN. There is neither a Ministry nor a Minister of Science in this country. The nearest is the Lord President of the Council, who is the Cabinet Minister responsible for the Department of Scientific and Industrial Research and the Medical and Agricultural Research Councils. Defence research, which in many fields borders on industrial research, is carried out for and on behalf of the service departments specially interested and a co-ordinating Defence-Scientific Council is maintained under the Chairmanship of Sir Henry Tizard. Sir Henry has recently also accepted Chairmanship of the Council which advises the Government on scientific matters in relation to civil affairs and he is in that capacity directly answerable to the Lord President of the Council.

The Department of Scientific and Industrial Research, besides turning back from war work to peace work and expanding its research activities at its own ten stations, has added to these by the establishment of a new joint Fire Research Board of the Department and Fire Officers Committee to examine the initiation and suppression of fires. In addition a new Mechanical Engineering Research Organisation has been set up and a special department and laboratory for investigation into mechanical engineering is being established. The budget of the Department which only in the last few years has topped a million pounds was 2·4 million for the year 1946-7 and is expected to be £3·4 million for the year 1947-8. These figures include grants to research associations proportionate (overall about 1:2) to the contributions made by industry. The total budget of the research association movement was £2 million for the year 1946-7 and will be £2·5 million for 1947-8 as against £900,000 for the year 1943. In addition the Department has established a separate intelligence section with the responsibility of keeping in touch with researches

outside the D.S.I.R.'s own ambit and of putting inquirers, both industrial and others, in touch with the stations and facilities of the Department. Among recent reports published by the Department are *Heating and Ventilation of Dwellings*, *Fire Proofing of Buildings*, *Atmospheric Pollution and Smoke Elimination*, *Fire Proofing Fabrics* and *Requirements and Properties of Adhesives*.

The Ministry of Works has its own scientific department under Sir Reginald Stradling and the Ministry of Supply, which now includes the Ministry of Aircraft Production, has co-ordinated the various research activities of these two ministries under Sir Ben Lockspeiser. They are largely devoted to defence and service purposes amounting in all to an expenditure of about £30,000,000 a year. A good deal of work is carried out on behalf of the Ministry by private industry in its own laboratories. At the Board of Trade Sir Stafford Cripps has appointed Sir Thomas Merton as his scientific adviser and has set up an operational research section under Dr. Gordon.

This does not exhaust the Government Departments active in this field. The Post Office and the Ministry of Food have their stations and committees and at the Colonial Office there are the Colonial Research Committee and Colonial Products Research Committee. This would seem an appropriate point to refer to the two very important conferences of Empire scientists convened in the summer of 1946, one under the auspices of the Royal Society and the other an official conference of representatives of the various Commonwealth governments. Although most of the topics considered were extra-industrial dealing with fundamental resources and needs, the recommendations, if carried out, will inevitably in due course redound to the benefit of industry.

At the end of 1945 Defence Regulations (Services for Industry, S.R. & O. 1614, 1945) were introduced by the Government to provide facilities to enable industry to raise compulsory levies for certain specific purposes including co-operative research. This issue of compulsory levies for research has been involved in considerable controversy. It is understood that although no orders have yet been instituted under this regulation preliminary inquiries have been made by the wool, building and iron foundries industries.

More recently in order presumably to prepare the way to implementing the reports of the "Working Parties" set up by the Board of Trade, an Industrial Organisation Bill has been before the House to enable development councils to be set up for specific industries, in order to increase their efficiency and productivity by promoting or undertaking scientific research and in other ways. One of the clauses of this Bill enables the Minister concerned to collect a levy from industries for which no development council exists, if he considers it necessary that finance should be made available for scientific research, development of exports, or the improvement of design in that industry.

ATOMIC ENERGY. The Atomic Energy Bill became an act in the autumn of 1946. Its object was to empower the Minister of Supply, in whose department the Atomic Energy Research Directorate was placed, to promote the development of Atomic Energy and it conferred on him powers of control over the unauthorised production or use of atomic energy and over the publication of certain information in regard to it.

An Atomic Energy Research Station has been established at Harwell, Didcot and "atomic piles" are in the advanced stage of construction, but it is too early yet to say what progress has been achieved in this country in the harnessing of atomic energy for the purpose of providing cheap and abundant power.

The Minister has recently brought out Atomic Energy (Disclosure of Information No. 1, S.R. & O. 1947 No. 100) Regulations under the Act which free dissemination of certain fundamental atomic research information from restriction. An Atomic Scientists Association has been formed to educate the public and explain to it the significance, potentialities and dangers of atomic energy.

THE INDUSTRIES CARRYING OUT RESEARCH. While there is no British industry today not carrying out any research, the vital question is whether the scale, set up and application is commensurate with its needs. British industries have either sprung from science (such as chemicals, plastics, electricals and aircraft) or developed from empiricism. Many of those which developed from empiricism have been substantially modified and some of them have been revolutionised by the impact of scientific knowledge, for instance, petroleum, textiles, instruments, glass and light engineering. There remain the basic industries and the so-called consumer goods industries, the mining of coal, building, some aspects of heavy engineering and machine manufacture on which the hand of science has so far only fallen lightly. The real purpose of a research department for an industry or industrial firm is, as Sir Clifford Paterson has well expressed it, to render scientific service. In other words, to endeavour to provide answers to the problems of, and to meet the technical needs of a progressive industry.

A recent F.B.I. survey has shown that in all there are well over forty thousand persons employed directly on industrial research and development in British industry. Of these about ten thousand possess a university degree or equivalent qualification. The total annual expenditure by industry on research and development within its own establishments is in excess of £25,000,000. A general overall expansion of twenty-five per cent. was planned for the years 1946-1947 and a further twenty-five per cent. for the years 1948-1950.

The bulk of research in industry is carried out by the industries that have sprung from science and depend on it for their maintenance and sustenance. The large firms in those industries possess large well-established and well-equipped research departments and even the smaller ones have a special scientific staff. Fundamental research within their own laboratories, and at universities too, is endowed and supported, for these industries well appreciate that their technical progress cannot be sustained without a steady flow of new knowledge which explains the functioning of their industry, the materials it uses, its processes and its products.

Encouraging attention to the practice of research in all its aspects is now being given by the so-called empirical industries. This has been manifest by an increase in the size, numbers and membership of the research associations associated with them, and by the setting up of research sections by many firms who, up till then, thought they could not afford the cost. They see now that they cannot afford *not* to possess the means whereby

they can maintain contact with the world of science and translate its results, where relevant, into terms relating to their own practices. Fundamental research for these industries has been pooled and is carried out by research associations such as cotton, wool or cast iron, or at universities, e.g. Sheffield for the glass industry, or in industrial firms themselves on behalf of the industry's research association, e.g. iron and steel and shipbuilding. An interesting example of results of such an approach is a recent announcement by the Cast Iron Research Association that it had developed a method of casting ordinary pig iron with a strength of 20–30 tons, that is an increase of 70 per cent. on normal cast iron. Resistance to shock is increased $2\frac{1}{2}$ times with only a small increase in hardness.

New industrial research associations include baking, felt, jewellery, jute, lace, paper, production engineering, rayon, shipbuilding, springs and welding.

The newly formed National Coal Board which includes the distinguished physicist, Sir Charles Ellis, as one of its members, has established a central research department under Dr. Idris Jones, late of Powell Duffryn Ltd., and each of the divisions of the Board also possesses its own scientific staff. Special aspects of coal and its use are also considered by the Coal Utilisation, Coke and Gas Research Associations and the Fuel Research Station of the D.S.I.R. as well as by Committees of the Ministry of Fuel and Power.

Interesting experiments are being undertaken by certain of the metal industries and by the timber industry in establishing development associations charged with the important function of stimulating interest in the employment of these materials in industry. They act as a channel through which problems are brought to the attention of the appropriate research organisation, undertake pilot production runs and the design of prototypes in collaboration with those interested.

Many of the trade associations too have been taking an increasing interest in the development of research for their industries and from their deliberation several of the new research associations have arisen, for instance the paper and board industry and the feltmakers. More recently, the Scientific Instrument Manufacturers Federation appointed Mr. Philpot, who has been Director of the Scientific Instruments Research Association, to act as Joint Director of the two bodies; an interesting pointer and precedent for the future which underlines the increasing role the scientific and technical considerations play in industrial affairs today.

Mention must be made too of the Industrial Research Committee of the F.B.I. which, in addition to its other activities in stimulating and fostering research in industry has organised a number of Industrial Research Conferences in various parts of the country. The Manchester Joint Research Council which comprises representatives of the University and the Chamber of Commerce has also been examining the special problems of the Lancashire region.

Reports have now been issued by nine of the Board of Trade Working Parties, cotton, wool, pottery, furniture, boots and shoes, linoleum, jewellery, hosiery and heavy clothing. Each makes special recommendations as to the manner in which research can assist the industry under review.

ADVANCES. The important achievements and advances in industrial research under consideration during this period are too numerous to set out *in extenso* and it must furthermore be remembered that much of

industry's research effort has been devoted to coping with inferior materials and developing satisfactory substitutes. Several processes for the large scale production of chemicals from petroleum are being exploited. There has been marked progress with jet aircraft engines and in the nickel and other alloys employed in their construction. A new process for the design of light electrical components by the deposition of metal and graphite into grooves and depression on pre-formed plastic plates (automatic electronic circuit making equipment) has been announced. There is a new and ingenious television process which should cheapen and simplify television transmission and reception, also a special optical development of perspex called transpex which should assist reproduction of television on a large screen. There have been marked developments with high frequency induction and infra-red heating methods. A new stainless steel and a new cast iron with performances considerably in advance of previous attainments. New synthetic waxes to replace imported vegetable waxes ; a new synthetic fibre terylene ; new drugs, myanesin, lachesine, sulphetron, investigations into another drug, streptomycin ; new plant for the large scale production of penicillin ; several new insecticides including gam-mexane, new dyes and detergents have been announced. Several new synthetic resins ; a new cement ; new plastics and a new plastic spraying process ; positex, positively charged rubber impregnated into textile fabrics ; new ventile fabrics which are water proof, and alignite textiles based on sea-weed derivatives. The first bridge made of aluminium alloy has been constructed in this country. There have been developments with the electron microscope, the Betatron, and in a variety of electronic devices and scientific instruments.

This list does not pretend to be more than a representative selection.

THE MANAGEMENT AND APPLICATION OF RESEARCH. Several large concerns, notably B.T.H. and Mond-Nickel, have recently appointed as their chief executive officers their former research directors. Many research directors have been given seats on the Boards of their firms.

It has been said that the success of research in industry depends upon three factors : research-mindedness at the board level, the firm's information department and the speed of application of research results. Inevitably the majority of the research carried out bears direct relation to the firm's processes and products ; large research departments, however, arrange for a proportion of the investigations to be devoted to fundamental problems. An important factor is the balancing of the research projects and dropping those that do not appear to be sufficiently likely to lead to a useful result.

A number of firms have their research departments situated in or adjacent to the works, whereas others have them sited a distance away. Some firms again have a central research department and others have a number of smaller units dispersed through the various works of the Company. So far as engineering researches are concerned, those which are more closely interlocked with immediate problems of design and production are generally carried out next to or in the works. It appears to be preferable, however, for engineering research of a more fundamental nature to be carried out in a separate self-contained building.

Relationship with the works is of vital importance. It is generally on a two-way basis with numbers of committees drawn from research and production to consider specific problems and the progress attained towards

their solution. Particular interest has been devoted in the last two years to the pilot plant or development stage. Often a number of years elapse before a scientific result is capable of large scale exploitation. This is due, apart from the inherent and often intractable difficulties in the nature of the material and of suitable plant and equipment for large scale or mass production, to organisational, financial and psychological difficulties within the concern. The experience of war showed that where cost was a relatively minor consideration and people were prepared for large scale adventures, this time lag could be considerably diminished. The production of such items of equipment as radar valves or other relatively small objects required in large numbers, lent themselves to a special technique called pre-production, which involved the development by the research department of a special pilot plant, which was continued in being until almost all the technical snags had been overcome.

Experience in America too, especially on two great projects of synthetic rubber and atomic energy, showed what could be done both with regard to the reduction in the time gap and a very large increase in output produced, compared with the laboratory scale. One of the keys seems to be production of an adequate number of chemical engineers, and chairs for the special faculty of chemical engineering have been endowed at the Imperial College of Science and at Cambridge University by Courtaulds and Shell respectively.

Another vital problem to which much attention has been devoted is that of the small firm which cannot afford to possess a research department but which has, or at any rate should have, equal need to use the results of science. The general recommendation of those who have studied this problem is that the firm should appoint or nominate from its staff someone specially charged with the duty of maintaining contact with the research organisations whose work would be likely to interest the firm, and of reading current research reports, patents abstracts, etc. so that he may be familiar with what is going on that is likely to affect the company, and of drawing it to the attention of those in authority. He should have power to arrange, where necessary, for researches that would benefit the firm to be carried out extra-murally. This pressing problem has been closely analysed by several authorities, including Sir Raymond Streat, Mr. C. G. Renold and Mr. J. G. Pearce. It is obvious that the research associations could play a useful role in helping small firms as they normally analyse and co-ordinate the results of research that affect their industry, and certainly the most useful contact for such a liaison officer of a smaller firm is the Industry's Research Association. It has furthermore been suggested that the research association should specially train some of its junior staff so that they will later join member firms in the capacity of liaison officers. The functioning of the information officer is especially important today in view of the great volume of publications which are taxing library abstracting and indexing records to the utmost.

The question of the use of science in industry in a larger sense has also been closely considered. The technique of operational research, or, as Sir Edward Appleton has defined it "Doing properly what was previously done after a fashion", should be a normal function of management, but where such an approach by means of an impartial examination of the firm's practice has been carried out it has always been found that there was scope

for improvement, more efficient use of materials, machines and personnel and a variety of savings and economies. The best means of approach in industry has still to be finally defined but it has been closely considered, bearing especially in mind the very successful results that were obtained by the operational scientists working on various sectors of the war machine such as Bomber Command, Coastal Command and Combined Operations. It is in reality perhaps a specialised aspect of a production efficiency service. It may be remarked in passing that the employment of such techniques in Government Departments may well be of comparable value.

Expenditure by industry on research has been kept down by inability to spend money rather than by lack of funds. The Income Tax Acts of 1944 and 1945 ensured that there was complete exemption from income tax for all money, either capital or income account, spent on research which related in any way to the firm's activities (see Scientific Research and Income Tax—explanatory notes issued by the Board of Inland Revenue). This provision, coupled with the income tax rebates on money devoted to educational and charitable purposes, under seven year agreements, has resulted in very substantial endowments by industry for research at universities, and such laboratories as those of the Cavendish at Cambridge and the Royal Institution in London.

This is an important aspect but only one aspect of the relationship between the industrial research laboratory and the university laboratory, which has been given close attention during the last two years. The universities themselves are keen to be of service to industry while maintaining their full independence, their right to publish freely all their results and their unfettered liberty to carry out research on whatever aspect of science they feel to be of interest, either because the worker has a personal predilection in that direction, or because it appears to be a fundamental problem ripe for solution.

Sir Robert Robinson, the President of the Royal Society, summed up the attitude that the intelligent industrialist should adopt towards the universities as "support the universities, give them their head and keep in touch with them". The special experiment of the Joint Research Council at Manchester is particularly worth watching to see what benefits can accrue to the industries of a region from the work and facilities of the local university.

EDUCATION. The great demand for scientists, not only by industry but for Government services and research for Universities and for the teaching profession itself, presented an immediate post war problem which the Committee on Scientific Manpower under Sir Alan Barlow was set up to resolve. In its report it recommended that the present output of the Universities of this country should be doubled as speedily as possible to provide 5,000 new scientists every year. To enable this to be done financial assistance to the universities on a far greater scale must be forthcoming and every effort should be made to ensure that adequate facilities for research are available for post-graduate students and for universities' staffs. It believed that the nation would certainly be seriously short of scientists in 1950 and would be unlikely to have an adequate supply by 1955. In allocating scientists during the reconstruction period the order of preference recommended was: 1. Teaching and fundamental research. 2. Civil science, both Government and industrial. 3. Defence science. It is

difficult to see what has so far been done, or indeed what can be done to fulfil this recommendation regarding allocation. The recent decision to call up for the services a very substantial proportion of young graduate scientists and engineers who have not previously done military service is certain still further to increase the scarcity of available research workers for industry. This, and the limited number of building licences granted to construct or expand laboratories, are the principal factors preventing the expansion of research in this country at the present time. The emphasis placed in the Barlow report on fundamental research is interesting inasmuch as it was generally conceded that in many fields we had in this country gained a clear lead. The reports on German industries published by the Board of Trade bear this out. During the war years, long term researches were curtailed and the results of past researches heavily drawn upon; the need to replenish this reservoir has been generally recognised, quite apart from its value in giving 'tone' to research workers. In the ordinary way fundamental research should be carried out at the universities and there have been a number of grants and scholarships for fundamental research in the universities given by industry. The technical colleges, too, have been carrying out relatively small amounts of research, both fundamental and industrial. The Ministry of Education has envisaged, following on the Percy Report, an ambitious scheme for greatly extending the scope and volume of their research activities.

One of the vital keys in the long term expansion of industrial research is the provision of adequate numbers of science teachers in the secondary schools and this again is one of the most serious and difficult problems that confronts us today.

GENERAL. The Scientific and Technical Register of the Ministry of Labour has continued to render an excellent service in providing industry with staff at lower and middle-levels for research departments, though it has at no time had fewer than 4,000 vacancies for scientific and technical positions on its list. The Association of Scientific Workers which now possesses a membership of some 17,000 scientists, a very substantial increase on the pre-war figure, has been active and convened several important conferences including one on Science and the Welfare of Mankind. A world federation of scientific workers has been formed at its initiative.

There has been marked interest too in the work of ASLIB (the Association of Libraries and Information Bureaux) which has acted as liaison between the various information officers in industry and supervised arrangements for abstracting and documentation methods. Public interest has been maintained by the science broadcasts of the B.B.C., by the science reporters and editors of the national press, by the Chemistry Research Exhibition of the I.C.I. in 1946 and in the last few weeks by the British Industries Fair, 1947, which has demonstrated in no uncertain manner by the goods it displayed that scientific research is now an integral part of British Industry.

Industrial Research— Legislation and Policy

THE association of governments with Industrial Research is a comparatively recent extension of their activities which has arisen in most cases since the first World War, though appreciation of the usefulness of science in connection with certain of the activities of states dates back a very long time. As far back as the 16th century the rulers of states recognised that science had applications to warfare and national defence and so we find Leonardo da Vinci, Galileo, Stevin, von Guericke and others, from time to time, directly concerned with the scientific aspects of military affairs. Lavoisier, too, served his country as head of the French State Arsenal where much of his scientific work was carried out.

The usefulness of science in connection with navigation, the currency and the revenue also brought the state into contact with science. Thus, in England, interest in navigation led Charles II in 1675 to establish the Royal Observatory at Greenwich as our first state-supported scientific institution for the purpose of correcting the tables of the positions of the heavenly bodies "for the use of his seamen." Somewhat later, Newton, possibly in view of his reputation and chemical knowledge, was appointed Master of the Mint and carried out a recoinage of the currency. Parliament in the 18th century, on the advice of naval men and merchants, recommended that a reward of £20,000 be given to the discoverer of "a more certain and practicable method of ascertaining the longitude than any yet in practice."

Other examples of the interest of the state in various utilitarian aspects of science are shown by the establishment of the Geological Survey in 1835; of the Inland Revenue Laboratory in 1843, for the protection of the revenue; and of the Meteorological Office in 1854 by the Board of Trade for the safeguarding of seamen.

So far, however, the state had not been concerned with the application of science to industry. Indeed, in a country such as Great Britain, with its long tradition of industrial supremacy based on individualism and private enterprise, such concern would have been regarded as being outside the legitimate field of government activity.

In Germany, however, the interest of the state in science was by no means as restricted as in England. The importance of scientific research as a means of serving industrial ends was very definitely recognised and as a result the German government established a series of technical high schools throughout the country and in 1887 set up the *Physikalisch-technische Reichsanstalt* with Helmholtz as its first director, to provide industry with precise standards of measurement, calibrations of instruments and accurate data on the physical constants of materials used in industry.

The Great Exhibition held in London in 1851, organised largely as a result of the Prince Consort's efforts, and particularly the Exhibition of 1862, did, however, call the attention of thoughtful people in England to the extent to which other nations, and particularly Germany, were becoming industrialised

and competitors in the world's markets which had for so long been a virtual British monopoly. As a consequence the importance of science in relation to industry began to be recognised and considerable efforts were made to improve the facilities for the study of science in technical colleges and universities. A few years later in 1888 the Imperial Institute was established as a memorial to Queen Victoria and was expressly charged in its charter with research into the uses of raw products from overseas.

No such establishment as the *Physikalisch-technische Reichsanstalt* was set up in England until 1900 when the National Physical Laboratory was established by the Royal Society with Sir Richard Glazebrook as its first director. Its establishment was largely due to the efforts of Lord Rayleigh who realised how the progress of modern industry depended to an ever increasing extent on accurate measurements and accurate knowledge of the properties of materials.

The Laboratory was given a home by the Crown in Bushy House, Teddington—a former royal residence near London, the Government providing £19,000 for alterations and equipment together with an annual grant of £4,000 which was later raised to £7,000. In his speech at the official opening in 1902, King George V, then Prince of Wales, pointed out that its object was “to bring scientific knowledge to bear practically upon our everyday life” and suggested that “if the nation's commercial supremacy is to be maintained facilities must be given for furthering the application of science to commerce and manufacture.” Thus the fact that the state had responsibility for ensuring that science should be applied in industry for the benefit of the nation was definitely, if somewhat tardily, recognised and a small beginning made.

Up to 1914 the National Physical Laboratory represented practically the whole effort of the state to provide scientific help to industry.

It was the first world war, which broke out in 1914, which first forced the Government to focus its attention on science, not as a piecemeal solution for individual problems requiring government action but as the basis of its policy. Early in that war considerable difficulties arose in obtaining supplies of materials which were not even manufactured in Great Britain and America and considerable defects in our industrial structure, consequent on the neglect of science by Government and industry, became apparent.

In 1915 the Board of Trade appointed a Committee with Lord Haldane as chairman “to consider and advise on the best means of obtaining for the use of British industries sufficient supplies of chemical products, colours and dyestuffs of kinds hitherto largely imported from countries with which we are at present at war.” A deputation from the Royal Society and other learned societies pressed the Presidents of the Board of Trade and of Education for “government assistance for scientific research for industrial purposes, the establishment of closer relations between manufacturers and scientific workers and teachers, and the establishment of a National Chemical Advisory Committee for these purposes.” The deputation was assured “that the Government had decided to establish machinery with wider powers than had been suggested, so as to make it possible to encourage research, not only in chemical but in other sciences affecting industry.”

An Order in Council of 28th July, 1915, set up a Committee of the Privy Council “to direct, subject to such conditions as the Treasury may from time to time prescribe, the application of any sums provided by Parliament

for the organisation and development of scientific and industrial research." The Order in Council further established that in addition there should be an Advisory Council to which should stand referred for their report and recommendation, proposals : (i) For instituting specific researches ; (ii) for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades ; and (iii) for the establishment and award of research student-ships and fellowships.

The outline of a scheme for the organisation of scientific and industrial research was set out in a White Paper (Cmd 8005) issued in July 1915. It was clearly stated in this White Paper by Mr. Henderson, President of the Board of Education, that the scheme was set up not as a temporary measure to enable the country to win the war, but to serve the nation in normal times of peace. "We cannot hope," he wrote, "to improvise an effective system at the moment when hostilities cease, and unless during the present period we are able to make a substantial advance we shall certainly be unable to do what is necessary in the equally difficult period of reconstruction which will follow the war."

The Advisory Council met for the first time on the 17th August, 1915. After a year devoted to drawing up plans for the future the Advisory Council had worked out a scheme of co-operative research associations to be set up by various industries with financial assistance from the Government. It also started the system of making grants to young graduates for the purpose of enabling them to undergo training in research.

Finally on the 15th December, 1916, the Department of Scientific and Industrial Research was established as a separate Department of State accounting for its own vote and responsible to Parliament through the Lord President of the Council.

The Secretary of the Department is responsible to the Lord President for the whole of the activities of the Department. Under him are a headquarters staff and a number of directors each responsible for one of the Department's establishments. The activities of these establishments and the activities of the Research Associations, which are autonomous bodies serving the needs of particular industries and assisted financially by the Department, are described elsewhere in this volume.

The organisation of the Department has remained substantially unchanged since its establishment in 1916. The National Physical Laboratory in 1918 became part of the Department, but the supervision of its scientific work continues to be exercised by the Executive Committee appointed by the Royal Society, which is accepted by the Lord President as a Committee of the Department.

Similarly in 1919 the Department took over from the Board of Education responsibility for the Geological Survey and Museum.

While the Department of Scientific and Industrial Research is responsible for a great part of Government-sponsored industrial research, it has not a monopoly of research. The defence services each has its own scientific research organisations concerned with the requirements of war production. The assistance of the Department is, however, available to these laboratories and also to all Government departments, some of which have research and development organisations of their own.

The Ministry of Fuel and Power is responsible through the Safety of

Research Board set up in 1921, for a station in which the problems of safety in coal mines are investigated and equipment used underground is tested. Work is also carried out at this station for the Factory Department of the Ministry of Labour and National Service.

The General Post Office maintains a research and development organisation mainly concerned with investigations of telephone and telegraph apparatus and systems and similar problems concerning radio telephony and telegraphy.

The Treasury is responsible for the work of the Government Chemist's Department. The Government Laboratory of which this Department is in charge was founded in 1843 as the Inland Revenue Laboratory for the chemical control of the revenue. It also undertakes certain other duties connected with various Food and Drugs Acts and undertakes chemical work for all Departments of State to which its advice is always available.

The Ministry of Works carries out full scale experiments and field experimental work for the research side of which it relies on the Department of Scientific and Industrial Research. Its various activities are co-ordinated by a Chief Scientific Adviser to the Ministry.

While the Government is responsible for a considerable volume of both scientific and industrial research it is with the universities that the responsibility for disinterested scientific research largely rests. Government assistance to the universities is provided mainly by the general grant to the universities administered by the University Grants Committee. This Committee was set up in 1919 and is appointed by the Chancellor of the Exchequer.

The necessary co-ordination between the various organisations mentioned above is provided by interdepartmental consultations and committees. In addition there is a system of advisory councils and committees by means of which the scientific knowledge, available both within and outside Government service, is pooled and made available to the Government departments.

A further measure to ensure that the best scientific advice should be available to the Government as a whole was the appointment in 1940 of the Scientific Advisory Committee*, which reports to the Cabinet through the Lord President of the Council.

In connection with post-war reconstruction, the efficient use of scientific resources and manpower is being examined in relation to national policy. In December 1945 the Lord President of the Council stated that the Government attached the greatest importance to science, and that the most urgent matter was manpower; he believed that there must be a balance between pure science and research, and applied science and research, and that there must be a sense of social urgency and priority in the use of pure scientists. In the Government's scheme to acquire for the state an increasing and developing responsibility for the direction and leadership of industry, it was felt that science must be given a sense of social and economic purpose and urgency, and a proper sense of priorities. The Barlow Committee on Scientific Manpower reported in May 1946, making recommendations as to policies which should govern the use and development of scientific manpower and resources during the next ten

* An Advisory Council on Scientific Policy was set up by the Lord President of the Council in 1947 to advise him in the exercise of his responsibility for the formulation and execution of Government scientific policy, and the Scientific Advisory Committee has now ceased to exist.

years ; these included a proposal for a greater degree of co-ordination between university policy and national needs.

The year 1945 marked the introduction of a new principle in the financial relations between the Government and industrial research. Up to this date, maintenance expenditure incurred by industrial undertakings in connection with research was allowed as a deduction from earnings in the assessment of income tax but no allowance was made in respect of expenditure of a capital nature. Now all research expenditure including expenditure on buildings, plant and equipment is afforded tax relief. This represents a clear departure from the hitherto sacred principle that untaxed income must not be used to produce additions to capital assets. The same principle is also applied to contributions by industrial firms to approved research associations or by universities for research. Taken for the country as a whole this represents a further considerable contribution by the Government to the research needs of the nation.

An Industrial Research Bill, aiming at the improvement and strengthening of the existing machinery for forming and operating industrial research associations, was introduced in the House of Lords by Lord Barnby as a private Bill in 1945. It was withdrawn since the Government was unable to find time for its consideration. The Defence (Services for Industry) Regulations 1945 were, however, amended to provide for consultation between the President of the Board of Trade and representatives of an industry, to secure that the provision of research facilities is the concern of the whole of the industry, and provide for a levy to finance research associations. During 1946 the President of the Board of Trade appointed a series of working parties, covering the boot and shoe, carpet, china-clay, cotton, cutlery, domestic glassware, furniture, heavy clothing, hosiery, jewellery, jute, lace, linoleum, pottery and wool industries ; their proposals included levies for financing research, to be made under the Defence (Services for Industry) Regulations or in some other way. In December 1946 it was stated in the House of Lords that preliminary discussions had taken place with the wool, building, iron-foundry and silk industries, regarding the use of the Regulations to further industrial research. Legislation announced in November 1946 is intended to supersede the Regulations, and consists of the Industrial Organisation Bill, introduced in January 1947. The purpose of the Bill is to provide for the establishment, for an industry, of a development council, the functions of which would include promoting or undertaking scientific research, and measures for the improvement of design. A council may impose levies on industry to finance its activities. In the case of industries for which there is no development council, levies may be made to finance scientific research, the promotion of export trade or the improvement of design. The Bill also provides for grants to the Council of Industrial Design and to design centres.

A White Paper on economic prospects and conditions was issued in February 1947. The wider questions of industrial policy are being dealt with through the National Production Advisory Council on Industry, under the President of the Board of Trade, which, together with the regional boards for industry, is giving material assistance to the production drive.

Advisory councils under the Ministry of Supply have been established for such industries as engineering, motor, machine tool, and gauge and tool industries. They include representatives of trade unions and employers,

and facilitate exchanges of views between the Government and Industry. A Council of Inquiry to deal with mining subsidence problems was announced in November 1946, and a Committee of Inquiry on Mineral Development under the chairmanship of Lord Westwood was appointed in August 1946.

In 1946 it was announced that the Iron and Steel Board would replace the Iron and Steel Control, and would concentrate, under the Minister of Supply, on the supervision of the development and reconstruction of the industry. For the cotton industry a five-year plan was announced in December 1946, "to enable the cotton industry to re-establish itself under the altered economic conditions of the world on a sound and stable basis"; this involves increasing output by such means as re-equipment and modernisation of mills, with financial aid from the Government. The Cotton (Centralised Buying) Bill includes a clause permitting the proposed Cotton Commission to prosecute research into matters relating to the cotton industry.

Government plans for nationalisation of the Coal Industry (Coal Industry Nationalisation Act) came into operation on 1st January, 1947. One duty of the National Coal Board, then established, is to secure the efficient development of the coal mining industry, and it may provide for training, education and research, acting on lines agreed with the Minister of Fuel and Power. During the third reading of the Bill, in May 1946, the Minister agreed that research was necessary, not merely to resuscitate the industry, but because the Government had in contemplation the co-ordination of all forms of fuel and power.

In connection with the motor industry, the Parliamentary Secretary to the Minister of Supply stated in April 1946 that the Government regarded it as a national necessity to maintain in the industry the spirit of research and development which was of inestimable value during the war.

The Patents and Designs Act (April 1946) simplifies the method of obtaining extensions of terms of patents, amending the Patents and Designs Acts 1907-42. A patentee who has suffered loss or damage from war may apply for an extension to the Comptroller of Patents instead of to the court. Protection is given to inventions and designs communicated under agreements or arrangements with other countries.

An agreement between Britain and the U.S.A. in March 1946, on amendments to the Patent Interchange Agreement 1942, is intended to avoid post-war infringement litigation arising out of each Government's use in war production of patents owned by nationals of the other Government. With reference to German patents, an international conference of members of the inter-Allied Reparations Agency held in 1946 in London decided that all patents of former German ownership now controlled by their Governments, and in which there is no non-German ownership and no non-German interest existing on 1st August, 1946, should be available within their respective territories to all nationals of those countries without payment of royalties or without any requirement to manufacture within the country where the patents exist.

The Atomic Energy Act (November 1946) closely affects scientific research. Its objects are to empower the Minister of Supply to promote the development of atomic energy and to confer on him powers of control over the unauthorised production or use of atomic energy, and over the

publication of certain information. The Minister of Supply has the general duty of promoting and controlling the development of atomic energy in Britain; he has power to produce and use atomic energy, to carry out research, and to produce, handle and deal in any article needed for those purposes. The Minister is empowered to obtain from any person information about any materials, plant or processes involved in the production of atomic energy; he also has power to enter and inspect premises where work on atomic energy is believed to be conducted. He may search any land for minerals whence may be derived any "prescribed substances" and work such minerals, but is required to make these materials and plant available for the purposes of research and education and commercial purposes not involving the production or use of atomic energy. A clause dealing with disclosure offences aims at restricting disclosures of technical information about large-scale plant for the production of fissile material or of atomic energy itself, but does not try to restrict the free exchange of basic scientific information; exceptions allowed in the Act include plant designed to be used solely in research and education, and plant in general use for purposes other than the production of atomic energy. Information already published in the foreign press may be freely re-published. The Comptroller-General of Patents is required to prohibit or restrict the publication of information about inventions dealing with atomic energy.

During the debates on atomic energy, the Minister of Supply stated that it was realised that the future of atomic energy in its industrial sense was dependent on extensive research, and that the Government intended to carry that research and development through with great energy and determination. It had been decided that as much of the resources of this country as could be made available would be devoted to that work. The central planning was in the hands of the Prime Minister and the Cabinet, advised by an advisory committee presided over by Sir John Anderson. It was intended to marshal the very best brains in the country. A research establishment had been established at Harwell, a team of experts was in Canada preparing plans to incorporate the very latest knowledge, and they were pressing on with the construction of the main production plant producing fissile material which the research establishment might require. A special organisation had been established for the purpose of designing and planning operations. The Government's policy was to encourage and support in every way research at the universities and elsewhere on fundamental problems which might at any time lead to discoveries of prime importance in this new field of nuclear energy. A Government amendment to the Bill was designed to ensure that atomic scientists would be able to have bona fide discussions about their researches without fear of prosecution under the Act. It was stated in Parliament that the Minister would treat fairly all inventors whose inventions were adopted, and that there would be compensation for inventors who developed inventions which the Crown found it necessary to suppress but did not itself use.

Equipment for research and experiment on atomic energy problems has been despatched to Australia.

The international aspects of atomic energy problems are dealt with by the United Nations Atomic Energy Commission, which in 1946 established three committees; the first of these deals with proposals for the control of atomic energy and weapons, for sanctions and for inspection; the legal

committee is to define the relationship between the controlling agency and the United Nations and to draft a treaty ; the scientific committee considers and recommends proposals for the exchange of information and for the peaceful use of atomic energy. In June 1946 the British Government pledged full support for the effort to bring atomic energy under effective international control for peaceful purposes. An international atomic development authority was favoured, with some scheme of inspection or control, but it was thought advisable to proceed as soon as was judged appropriate with the exchange of scientific information in order to promote an atmosphere of goodwill and confidence. In August 1946 it was stated that the British Government accepts the plans put forward by the United States and Russia in regard to atomic energy, but believes that they require to be formulated into a single plan.

In the case of Germany, the Allied Control Council in April 1946 approved a law controlling scientific research in Germany, with the object of preventing Germany from establishing a new field of war potential, especially in atomic research.

It will be seen from this brief survey that from very hesitating beginnings the attitude of the Government to science has grown, so that today the Government is not only the largest single contributor to scientific and industrial research but, in view of its wider functions, has become perhaps the largest user of research and having started with an interest in science for purely limited, specific, utilitarian ends, now fully recognises the importance of science in relation to the whole national economy and prosperity, and as a basis of policy.

Careers in Professions Associated with Industrial Research

ISABELLA WILLIAMS, M.A.

INDUSTRIAL Science and Research covers a very varied group of professions, and includes many different types of work, each fulfilling an important function. Entry to the professions is made through various channels, and at any stage from the age of 15 upwards to university standard. In this article an attempt is made to indicate these channels of entry, the qualifications offered by various bodies, types of training, scope of work, and other relevant factors such as method of appointment and financial help in training. No real distinction can be made between professional and technical education in this sphere, since the two aspects overlap and are combined in various ways.

Under the Education Act 1944, it will be possible to proceed to a secondary (technical) school at the age of about 11. The aim of these schools is to equip pupils with a good general education that will enable them to enter skilled employment with interest and competence. Existing schools are largely related to the engineering and building industries, and further development is expected to cover a wider group of trades and to extend beyond the highly industrialised areas. This type of education was described by the Spens Committee* as "a liberal education, with science and its applications as the core and inspiration". Single schools may centre their work on a particular industry, while others may combine a variety of industries, and it is expected that girls will take increasing advantage of the provision. It is anticipated that pupils who show capacity for further education will be encouraged to continue their full-time education up to the age of about 18, with a view to entry into a major technical college, or a university, with or without a period of practical experience. In general, however, these schools will cater for children of 11—16. The Education Act also provides for part-time education up to the age of 18, and for this purpose employers will be required to release youths for one day each week. At the present time, partly in view of these official changes, and partly because of an increasing awareness of the necessity for the best possible education for all grades of workers, the whole system of apprenticeship training is under review. The professional bodies and individual firms are examining the whole system, reports are being issued, and firms are announcing apprenticeship schemes which give scope for advancement to the limit of the individual workman's capacity, while some of the larger industries have established apprenticeship training schemes on a national basis. The important factor in all these schemes is that opportunity is provided for technical education in addition to workshop practice. While the larger firms often organise their own training departments, it is impossible for the smaller firms to do so, and the Census of Production, 1935, revealed that a very large proportion of the

* S.O. Code No. 27-248.

occupied population works in small firms ; out of 53,217 firms, more than half employed less than 50 persons, while only 2,280 employed 500 persons or more. It is these people who will benefit greatly from the proposed extension of technical education. An important feature of technical education, as now envisaged, is that there should be opportunity for normal social and cultural pursuits, and this is to be achieved by having periods of education alternating with periods of workshop practice.

Part-time students work for National Certificates, which are awarded by the Ministry of Education in arrangement with the appropriate professional bodies (*see* Appendix D). The Ordinary National Certificate is awarded at the completion of part-time courses lasting for three years, from the age of 16, and the Higher National Certificate is awarded on successful completion of courses lasting a further two years. The courses in technological subjects are designed to give training in the fundamental scientific principles underlying the industries in which the students are employed, and normally involve attendance at evening classes three times weekly during winter sessions, but in some cases day-time classes already exist. Some additional courses may lead to endorsement of the original certificate. Ordinary and Higher National Diplomas in Mechanical Engineering and Electrical Engineering are available, generally for students who have not entered employment. Particulars of these courses may be obtained from local technical colleges or education offices. The City and Guilds of London Institute, Department of Technology, holds annual examinations at various centres for certificates awarded by the Institute, and for which courses are provided at technical colleges (*see* Appendix C).

Students who continue their full-time education up to the age of 18 may enter a technical college or university for full-time study, or may undertake a sandwich course of periods of technical training alternating with full-time study at a technical college. The university student may receive practical training either before, after, or during the vacations of his university course. Many technical colleges have provision for reading for university degrees, either as full-time or part-time study, and details of these should be obtained from local colleges or from education offices. Increasing attention is being paid to the need for technicians and scientists with the best possible training to undertake the direction and development of industry, and many universities have commenced schemes of expansion directed particularly towards increasing facilities for scientific education, while financial assistance is provided for in the Education Act. Graduates with a broad scientific education, together with specialised knowledge of the appropriate branch, may proceed to the highest positions in research, production, planning and other branches of industry, as well as to the research associations, Government departments and university and technical teaching staffs. The Advisory Bureau for Research has formed a department with the object of encouraging advanced study and specialisation, and is prepared to offer guidance to university graduates in undertaking specialist studies.

Many of the professional associations have instituted examinations, or accept equivalent examinations, which qualify students for membership. Corporate membership of these bodies implies a recognised standard of competence, and courses of study leading to the examinations are provided at technical colleges. The organisations are dealt with individually in the appropriate sections of this article. (*See also* Appendix B.)

Another mode of entry into industry is by statutory qualification, for which courses are provided at the university and technical college. These include the Ministry of Fuel and Power Certificate of Competency in Mining, and the Board of Trade Certificate of Competency in Marine Engineering.

Before considering the professions individually, mention should be made of the scheme for training within industry, developed by America and adopted in this country during the war after an official from the Ministry of Labour had studied the American system, of instruction for supervisors in job instruction, job relations, job methods and programme development. This intensive type of training will be used in post-war programmes for the quick and efficient resettlement of employees from the Forces as well as the training of apprentices.

A considerable amount of financial help is available for all aspects of technical and scientific education. State scholarships and local authority county major scholarships are awarded on the result of examinations at the Higher School Certificate stage, as are entrance scholarships to the universities. It is the policy of the Government to provide adequate financial assistance to all who show ability to benefit by university education. Many scholarships and grants are offered by industrial firms and associations and professional institutions at all stages of a student's career from the commencement of higher training to the continuance of study and research beyond the graduate stage. Government grants are also made for scientific investigation, through the Royal Society. A special scheme has been instituted to assist members of the Forces to complete apprenticeships and to train for professional careers; details of these are available from local offices of the Ministry of Labour, Resettlement Advice offices and Appointments offices of the Ministry of Labour. Details of these scholarships and grants will be found at the end of this article.

The whole system of technical education is under review, as has been noted, by the professional bodies, and is receiving much attention from the Government. The 1944 Education Act makes provision for the technical education of young persons up to the age of 18. In 1945 there were over 200 technical colleges in Great Britain, and the number of National Certificates in engineering awarded during 1942-45 was 60 per cent. above the pre-war figure. Plans were announced for national technical education in 1945, making provision for all workers from craftsmen to research workers and managers. The Percy Committee on Higher Technological Education, reporting in July 1945, recommended a standing organisation to survey industry and co-ordinate the education of scientists and technologists, and the establishment of a number of "Colleges of Technology." The Scottish Council on Education has recommended the national planning of technical education, and means for increasing the numbers of potential research workers. The Barlow Committee on Scientific Manpower made important recommendations in 1946 for increasing the output of scientific graduates, and for improving research facilities. It was announced in 1946 that the status of technical colleges was to be raised and their influence in the industrial field extended. The major technical colleges will provide for both local and regional needs. Where the demands for courses or advanced instruction are limited, provision will be concentrated on a national basis; in some cases the requisite provision will be made in new or separate institutions, but the Minister of Education has asked authorities to offer

accommodation in existing colleges for use as national schools or departments for particular branches of technology. A national council for technology is to be established to co-ordinate the work of the regions and ensure that a comprehensive national view is taken, and it will determine whether the technical colleges should award a diploma or degree.

Government appreciation of the importance of research has received practical recognition in the form of increased grants to the universities, and in 1946 the Chancellor of the Exchequer announced new terms of reference to enable the University Grants Committee to play a more positive and influential part in the new phase of rapid expansion and planned development of the universities, which are being pressed to increase the numbers of students by 100 per cent. as well as the volume of scientific research. The Government has stated that it is in general agreement with the conclusions of the Barlow Committee's recommendations regarding scientific manpower.

In order to bring about closer links between industry and scientific education, the Ministry of Education in 1946 announced a scheme to encourage more full-time teachers to return to industry, so as to keep in touch with industrial developments and to freshen their industrial and commercial experience; the scheme allows special leave up to a maximum of six months with full pay and six months without pay. Interchange schemes between industry and university research workers have been adopted by some universities.

Finally it may be noted that appointments to the professions concerned with industrial science are being made increasingly through the Ministry of Labour and National Service, which maintains Appointments Offices in thirteen towns, and a Careers Research Station which publishes information relating to careers, in the form of handbooks. The Technical and Scientific Register of the Ministry's Appointments Department (York House, Kingsway, London, W.C.2) has the benefit of Advisory Committees composed of leading representatives of the various professions catered for by the Register; they include electrical engineering, mechanical engineering, civil engineering, chemistry, scientific research, and public utilities, while an advisory council was established in 1946 under the chairmanship of the Minister of Labour and National Service to advise on the work of the Appointments Department. Other bodies which assist in placing students and qualified scientists and engineers are the appointments boards of the universities, the professional institutions, and the Professional Engineers Appointments Bureau (13, Victoria Street, London, S.W.1). Many of the posts in industry, research and teaching, however, are publicly advertised in the daily, educational and technical press.

ACTUARIES

The Actuary is concerned with the application of the theory of probability and compound interest to practical problems. The bulk of the employment is provided by insurance companies, but there is increasing scope in Government departments, commerce, transport and industry generally, as well as in private practice; for, *inter alia*, the actuary is of necessity also a trained statistician and is, in fact, regarded by the Treasury as fitted for statistical work in Government service at all levels.

A good general education up to at least matriculation standard is required, but the would-be actuary should preferably have reached Higher Certificate standard in mathematics before entering employment in a Life Office. The Offices also recruit a number of university graduates in mathematics who are granted certain exemptions from the professional examinations. Professional status is granted by the Institute of Actuaries, Staple Inn Buildings, Holborn, London, W.C.1, and by the Faculty of Actuaries, 23, St. Andrew's Square, Edinburgh, from which bodies full details may be obtained.

BIOCHEMISTRY

The biochemist may take an honours degree in biochemistry at a university, or an honours degree in chemistry with the subsidiary subjects of botany, zoology or physiology, and a post-graduate course in microbiology. An honours degree in chemistry may be accompanied by physics and mathematics as subsidiary subjects, and followed by post-graduate work in a biological science. A period of research is a useful asset.

Openings are to be found in food manufacturing industries, in combines dealing with milk, in firms marketing agricultural fertilisers, insecticides, etc. and in firms manufacturing medicines.

BIOLOGY

Biology, the study of living things, while of increasing importance in the educational field, has fewer openings in industry than chemistry or physics. It is necessary to read for a university degree in botany and zoology, but some knowledge of chemistry and physics is necessary. Openings may be found in fishery research and marine biological investigations, in universities and technical colleges, in agriculture, and with Government departments and firms that are interested in these subjects.

BREWING

Brewing comprises a wide range of subjects. Those who aspire to become Brewers should obtain (a) an approved degree in science, with chemistry as a main subject, followed by a post-graduate course of one year at either the British School of Malting and Brewing (University of Birmingham) or the Heriot-Watt College, Edinburgh; or (b) the Diploma of Brewing of the British School of Malting and Brewing (University of Birmingham) or of the Heriot-Watt College, Edinburgh; or (c) the Associate Membership of the Institute of Brewing. An approved degree in science and the aforesaid diplomas exempt from the Associate Membership examination of the Institute of Brewing.

Amongst the many technical colleges at which some portion, at least, of the training for the Associateship Examination may be taken, special mention should be made of the College of Technology, Manchester and the Sir John Cass Technical Institute, London. Full details of training and scholarships may be obtained from the Secretary of the Institute. The Institute offers various classes of membership which are listed in Appendix B.

BUSINESS ADMINISTRATION

Business administration is not strictly within the scope of this article, except in so far as scientific or technical qualifications are required in managers and others, and those have been covered in previous sections. It is sufficient to note that the professional training for business administration is receiving increasing attention, particularly since the report of the Newson-Smith Committee on the subject in 1945. Courses in business administration at the universities were largely suspended during the war, but are being resumed. The Ministry of Labour has announced the commencement of a General Business Course and a Specialised Business Course for ex-service men. The examining body, the Institute of Industrial Administration, Artillery House, Artillery Row, London, S.W.1, believes that efficient management can be achieved by personality plus specialised professional training, plus specialised executive experience supplemented by training in the principles and technique of industrial administration.

The Government business training scheme is intended for suitably qualified men and women who have completed war service and who have attained the school certificate or equivalent standard of education. There is a three months' general business course, while specialised courses may be taken subsequently, extending up to a period of two years, to enable a man to acquire the detailed practical knowledge for management in a particular business. Full information may be obtained from the Regional Appointments Offices of the Ministry of Labour and National Service. An administrative Staff College has been established at Greenlands, Henley-on-Thames, where a three months' course has been designed for the study of the principles of administration in industry, commerce, trade unions and Government.

CHEMISTRY

For the chemist, a full-time course leading to a university degree in science, with honours in chemistry, is recommended. Physics and mathematics are recommended as subsidiary subjects to be studied, while a period of post-graduate research is an asset. Part-time study at a technical college may be undertaken by those employed in a laboratory or works, leading either to an external degree or to one of the following qualifications.

The Royal Institute of Chemistry conducts an associateship examination. Full details regarding the Institute's grades of membership should be obtained from the Registrar of the Institute. Technical colleges offer three or four years' full-time courses leading to degrees, diplomas and to the Associateship of the Institute. For students who have not reached matriculation or an equivalent standard, part-time courses lead to the National Certificates in chemistry.

Chemists may be employed as lecturers and teachers, as production and research workers in industry and agriculture, as scientists in Government departments and local authorities, and in independent practice. The requirements of industry are for chemists of varied types to undertake work in connection with dyes, textiles, chemicals, paints, rubber, explosives, plastics and, in fact, in practically all industries. Industrial chemists may be employed as analytical chemists, research chemists, control chemists, consulting chemists, and chemical engineers (see appropriate section).

Government departments and research associations provide numerous openings. The Royal Institute of Chemistry maintains an appointments register and a list of laboratory assistants, and issues a booklet, *The Profession of Chemistry*, containing detailed recommendations as to the education and training of a chemist, with a synopsis of possible careers.

The qualifications of the Royal Institute of Chemistry—the Fellowship (F.R.I.C.) and the Associateship (A.R.I.C.)—are officially recognised by Government and other authorities both at home and in other parts of the British Commonwealth. Chemists who have obtained good honours degrees, or equivalent qualifications, with chemistry as the principal subject, and have received adequate training in certain allied sciences, may be admitted to the Associateship without further examination. Those who have not obtained such qualifications, or who desire to show that they have passed an examination conducted by the Institute itself, with its insistence on a high standard of practical laboratory efficiency, may take the examination for the Associateship. Associates of at least three years' standing may be admitted to the Fellowship, either by taking a further examination in a special branch of chemistry or by submitting the results of work sufficient to justify exemption therefrom.

A public analyst must hold the Diploma of Fellowship or Associateship of the Royal Institute of Chemistry, and the Institute's certificate in the Chemistry (including Microscopy) of Food and Drugs. Appointments are available with local authorities, food manufacturers, Government departments and in private practice.

After obtaining a qualification in chemistry, the student may undertake specialisation, with further study, in such subjects as agricultural chemistry, glass technology, brewing and fermentation, textiles, metallurgy, etc., and may then enter a works appropriate to his training. Laboratory assistants may enter employment at the age of 16 to 18, the general requirements being good general education with special ability in science. Government departments and most laboratories employ junior assistants from the age of 19, of Higher School Certificate or Intermediate B.Sc. standard. These may achieve further advancement if they follow part-time training at technical colleges for external degrees or similar qualifications.

COMMERCIAL ART AND DESIGN

In the past openings for the designer in industry have been limited, but there will probably be increasing opportunities in the future. The growing appreciation of the value of good design has found expression in the establishment of the Council of Industrial Design, to assist industry to improve the design of machine-made goods. One of its objects is to set up design centres for trades to which they can be of use.

A student may generally specialise at an art school in a particular branch of design for which he has special aptitude. The following training courses are available: Ministry of Education Art Teachers' Diploma, including a National Diploma Examination in Design; Associateship of the Royal College of Art, South Kensington, London (candidates complete a three years' training in a recognised art school); London University Diploma in Fine Art; B.A. Degree in Fine Art (Durham (Newcastle Division) and Reading); Diploma of the Colleges or Schools of Art in Scotland (Aberdeen,

Dundee, Edinburgh, Glasgow). The trained designer may practise as a consultant, or as a specialist in one industry.

The Scottish Advisory Council has recommended the establishment of a central college in Scotland for the further training of post-graduate students in industrial design.

The Council of the Society of Industrial Artists published a Report (1944) on the education and status of the designer in industry, and recommended the establishment of a preliminary basic course standard in all approved local art schools, of specialist courses in regional colleges for completing the training of designers for employment in any one industry, and of an advanced course in a central college for completing the training of independent practitioners or consultants. Diplomas would be granted by a Board of Industrial Design Education. The specialist course would last for three years, and the non-specialist consultant course would extend to four years. Refresher courses and post-graduate travelling fellowships are also recommended.

The proposed Glass Design Research Department at the Edinburgh College of Art is intended to serve the whole glass industry in the United Kingdom. The courses, designed for post-graduate students and industrial craftsmen, will bridge the gap between student training and full industrial experience, and will also provide refresher courses for members of the industry.

The National Register of Industrial Art Designers, established in 1937 by the Board of Trade, maintains a register of qualified designers for industry, and brings registered designers into touch with manufacturers and others seeking their services.

In 1936 the Council of the Royal Society of Arts, with a view to enhancing the status of industrial designers, instituted the distinction of Royal Designers for Industry. This distinction, "R.D.I.", equivalent in the realm of industrial design to "R.A." in the realm of the Fine Arts, is conferred on British designers "who have attained high eminence and efficiency in creative design for industry". The number of persons who may hold the distinction at any one time is limited to 40.

COST ACCOUNTANCY

Cost accountancy is a specialised branch of accountancy mainly concerned with methods to secure maximum productive efficiency by a strict control over expenditure. Candidates should have a good general education up to the age of 16. A post may be obtained in the costing department of a works or undertaking, while studying for the examinations of the Institute of Cost and Works Accountants, which grants associateship and fellowship qualifications. The demand for cost accountants, which increased greatly during the war, may continue to do so as modern production methods are increasingly valued in industry. There is some scope for private practice.

Details may be obtained from the Director, Institute of Cost and Works Accountants, 23, Queen Square, London, W.C.1.

ENGINEERING

Engineering, which has been defined as the "art by which the properties of matter are made useful to man in structures and machines," is the largest profession offering careers in the field of industrial science, and is varied

both in the branches in which the engineer may specialise and in the type of work which he may undertake. Entry to the profession may be made at various stages. Boys entering from school, without any examination qualification, generally become skilled craftsmen, and may rise to professional status by part-time study. It is possible to enter a junior technical school for full-time general technical education, between the ages of 13 and 16, but these provisions will be altered under the new Education Act (*see* early part of article). Pre-apprenticeship courses are popular, providing a one-year course for boys between leaving school and commencing apprenticeship at about the age of 16, while many firms have instituted apprenticeship training schemes, lasting for three years or longer, in order to facilitate the promotion of those with ability, with mutual benefit both to the industry and the employee; some of these courses are extended to include girl employees. These courses lead to the award of the National Certificates, the Higher Certificate being accepted by some of the professional institutions in lieu of part or whole of the membership examinations, and it is possible for some of the holders to proceed to the universities.

Boys of 16 or 17 who have attended modern or technical schools (according to the interpretation of the 1944 Education Act) may proceed similarly to attain National Certificates through an apprenticeship or may take a National Diploma as full-time students at technical colleges. It should be noted, however, that the Act makes it compulsory for every local education authority to provide adequate facilities for further education, full-time or part-time, for persons over compulsory school age not in full-time attendance at an educational institution or receiving satisfactory training.

The boy leaving school at 18 may proceed to a university and take a degree, or may take some practical training prior to a university course, or may become an apprentice and work for a degree or for the National Certificates by part-time study, or may take a full-time course of technical training at a technical college and work for the Higher National Diploma or professional institution qualification. Entry to a university can be secured by the student who has attained matriculation standard; the course for an engineering degree lasts for three or four years. In some cases technical colleges also provide courses leading to degrees, and particulars should be obtained from the appropriate local education authority or technical college, or in Scotland from the Scottish Education Department, St. Andrew's House, Edinburgh, 1. A list of university courses is given in Appendix A. The degree course requires specialisation in one of the branches of engineering, while in some cases internal diplomas are also granted at the graduate and post-graduate stage.

The majority of engineers, graduates and others, become members of one of the professional institutions, which, while they do not hold regulating powers, provide facilities for the exchange and dissemination of knowledge and ideas, as well as recognised professional standards of attainment. A general educational standard equivalent to that of the School Certificate examination is usually required from candidates for non-corporate membership, while corporate membership is open to those with the requisite academic qualifications and practical experience (*see* Appendix B).

Experience of war-time training in the Forces has had the effect of changing the emphasis from technical education to functional training, and this may have repercussions in industry. Firms are making use of vocational

guidance in the selection of students for various branches of engineering to which they are best suited, and the rôle of training is then to teach them the principles of the job, followed by functional training to teach them how to apply those principles to the specific job. This can be applied to every branch of work within the industry, and can produce results more quickly and efficiently than the older more haphazard methods of finding a suitable niche.

Although the numbers of qualified women engineers are comparatively small, they have steadily increased, and the Women's Engineering Society urges that encouragement and training facilities should be freely available to those whose talents lie in this direction. Most branches of the engineering profession are now open to women.

AERONAUTICAL ENGINEERING

Aeronautical engineering comprises the design and construction of aero-engines and airframes, propellers, de-icers, hydraulic and electric systems, etc.; research; and the production of aircraft engines and equipment. Engineers may specialise in the construction of airframes or of aero-engines, while airframe designers may specialise in aeroplane or flying boat design.

The qualified engineer may find employment with firms manufacturing airframes or aero-engines; with civil air transport companies in servicing and repair workshops; with research establishments such as the Royal Aircraft Establishment at Farnborough or the National Physical Laboratory at Teddington; in research and teaching at universities and technical or aeronautical colleges; with the Fighting Services; with a Government department such as the Air Ministry, the Ministry of Supply or the Admiralty; or in technical journalism.

There are two main modes of entry to the profession. A full-time university course in engineering may be followed by or sandwiched with a course of practical training in industry, usually taking five years in all; this may be followed by further research and specialisation, and may lead to posts in design offices and laboratories of aircraft firms or Government aeronautical research establishments. The other mode of entry is to undertake practical work in an aircraft firm with concurrent part-time technical study, lasting about five years in all. Many large aircraft firms operate schemes of workshop training correlated with day-time technical education leading to the Ordinary National Certificate in Mechanical Engineering, followed by the Higher National Certificate with endorsements in aeronautical engineering, and associate fellowship of the Royal Aeronautical Society. A student wishing to specialise in research should acquire a degree in engineering, mathematics, physics, chemistry or electricity, according to his branch of work, and pass the Royal Aeronautical Society's examination, or gain the Higher National Certificate in Mechanical Engineering.

Full-time courses in aeronautical engineering are available at the universities of Bristol, Cambridge, London, and University College, Southampton, while some technical colleges provide facilities for reading for the London external degree. The Royal Aircraft Establishment Technical College, Farnborough, Hants, provides specialised training and education in aeronautical engineering, and engineering apprentices, on completion of their training, are accepted in the research laboratories and

the design offices ; applications for admission should be made early in April of the year of entry.

The Department of Aeronautics at the Imperial College of Science and Technology, South Kensington, London, S.W.7, is mainly a post-graduate department, providing one year courses in aerodynamics and the design and construction of aero-engines, with a second year course for students desiring to undertake research. At the College of Aeronautics, Cranfield, Bletchley, Buckinghamshire, two year courses are available for selected students of graduate standard, trained in engineering, physics or mathematics, but a university degree is not an essential qualification. Technical membership of various professional organisations constitutes a recognised qualification ; these include the Royal Aeronautical Society, the Institution of Mechanical Engineers, and the Institution of Production Engineers (see Appendix B).

AUTOMOBILE ENGINEERING

Automobile engineering is a specialised form of mechanical engineering, and is concerned with road vehicles and other self-propelled vehicles driven by internal combustion engines, such as farm tractors and military tanks. An all-round knowledge of automobile engineering is advised before specialisation, but a general choice is made between chassis engineering and body engineering.

Part-time students work for the National Certificates in mechanical engineering, possibly with endorsement in automobile engineering. Full-time students may take a university degree in mechanical engineering, or full-time or sandwich courses in technical colleges.

The Institution of Automobile Engineers offers professional qualifications, which are listed in Appendix B, and details should be obtained from the Secretary. The Institution also publishes a leaflet, *Recommended Course of Training for Automobile Engineers*, which may be obtained from the Secretary. It recommends that intending automobile engineers should matriculate before leaving school, and then obtain training in the theory and practice of engineering in both college and engineering workshop, either following a three-year full-time day course at a technical institute to secure an engineering degree or diploma followed by a pupilage course of three years in an engineering works ; or a three or more years' apprenticeship in an engineering works supplemented by evening or part-time day classes to secure a National Certificate, followed preferably by a full-time course at a technical institution to secure a degree or diploma ; or a sandwich course combining the two. The leaflet includes advice on practical training, lists of institutions offering full-time courses for diplomas and degrees, evening and part-time day courses for National Certificates, and information on recommended evening-class work for automobile students.

CHEMICAL ENGINEERING

The intending chemical engineer should take a university degree, but there are several approaches. He may take a degree in chemical engineering, spending part of his vacations at a chemical works. Another line of approach is to take a degree in chemistry or engineering, with a post-graduate year in chemical engineering. Post-graduate research, leading to a research degree, would be advantageous in securing a lectureship.

Chemical engineering is an expanding profession, and facilities for education and training are increasing. The Shell group of oil companies has endowed a school of chemical engineering at Cambridge. Courtauld's has provided a chair at the Imperial College of Science and Technology, while Mr. C. F. Brotherton has given a sum of money to the University of Leeds for chemical engineering development.

The demand for chemical engineers has led the Ministry of Education to arrange for full-time training courses in a number of technical colleges, lasting for one year, and available to men who have graduated in engineering, physics and chemistry, or have other recognised qualifications (i.e. the Higher National Certificate in engineering or chemistry, or a general science degree in mathematics, chemistry and physics). The courses, which are recognised by and operated in co-operation with the Institution of Chemical Engineers, qualify for allowance under the Further Education and Training Scheme. Details are given in the Ministry of Labour leaflet P.L.216, and applications should be made to the Technical and Scientific Register, York House, Kingsway, W.C.2.

Chemical engineers are needed, according to a memorandum by the Institution of Chemical Engineers and associated bodies, for the rehabilitation of the chemical and petroleum industries, in the plant industry, to design chemical plant for direct export, and for overseas work in the British Commonwealth. A syllabus for a degree course in chemical engineering is published by the Institution.

Chemical engineers are also needed to design and operate plant used in the commercial development of chemical products, including biochemical and agricultural chemical products. The courses cover chemical engineering processes, chemical plant construction, factory design and construction, and industrial economics.

The Institution of Chemical Engineers offers various grades of membership, listed in Appendix B, and further details should be obtained from the Secretary at the Institution. The Associate Membership Examination of the Institution is held annually. A copy of *Extracts from the By-Laws and Hints to Candidates* can be obtained free, and past examination papers at 1s. per set, from the Joint Hon. Secretaries of the Institution, 56, Victoria Street, London, S.W.1.

CIVIL ENGINEERING

The various branches of civil engineering are more directly concerned with *Planning and Construction*,* and are treated in the *Careers* Section of that reference book. Certain branches of mechanical engineering, such as heating and ventilating, are also treated in that book.

ELECTRICAL ENGINEERING

The main branches of electrical engineering are power generation and distribution, heavy manufacturing, traction, installations, meters and instruments, and telecommunication. The Institution of Electrical Engineers recommends a full-time educational course at a university leading to a degree in electrical engineering, combined with a post-graduate apprenticeship (lasting at least two years); one year of the apprenticeship may be taken before the university course, or the whole of it may be taken

* Published annually at 25s. by Todd Reference Books, Ltd., 49, Park Lane, London, W.1.

afterwards. Additional practical training should be taken during the summer vacations. Students who have not matriculated may pursue similar full-time courses at university and technical colleges, leading to the Higher National Diploma, or to college diplomas. "Sandwich courses" are available in some areas, wherein periods of practical training are alternated with full-time education. The Institution also recommends, for suitable students, a part-time education course at a technical college or school, leading to the Ordinary National Certificate in electrical engineering, and then to the Higher National Certificate; these are taken while serving an engineering or school apprenticeship.

Admission to corporate membership of the Institution of Electrical Engineers is a recognised qualification (*see* Appendix B) and full details should be obtained from the secretary of the Institution, which also publishes a list of universities and colleges having full-time courses, and of colleges providing courses leading to National Certificates and Diplomas. The Institution, in its report on *Part-time Further Education at Technical Colleges* (1945), makes recommendations for provision of education for the groups of craftsmen, technicians, and professional engineers, and for the further education and training of electrical engineers returning from the Services.

There is increasing scope for women in certain branches of electrical engineering, particularly in connection with design and research, and information may be obtained from the Women's Engineering Society. A Certificate and Diploma in Electrical Housecraft for teachers and electrical demonstrators and saleswomen are awarded by the Electrical Association for Women. Further information may be obtained from the Director, Electrical Association for Women, 20 Regent Street, London, S.W.1, which has published an interim report on *Post-War Reconstruction*, giving opinions on education and careers.

GAS ENGINEERING

Gas engineering may be regarded as a branch of chemical engineering, concerned with "the manufacture and operation of apparatus for the preparation and utilisation of coal gas in every department of domestic and industrial life where a readily and accurately controlled source of smokeless heat is required." The gas engineer may be concerned either with the manufacture, distribution and utilisation of gas, with gas engineering and contracting, with commercial management or with research.

In general a pupil engineer should hold a B.Sc. degree, in chemistry, physics, metallurgy, engineering, mathematics, chemical engineering, mechanical engineering, or fuel technology, according to which branch is chosen for specialisation. The Institution of Gas Engineers has an education scheme for those who enter the industry from the secondary school, and boys recruited at 16 to 18 years can enter either the commercial or engineering and chemical branches, and work for the Associateship Diploma of the Institute of Chemistry, or the Diploma in Gas Engineering (Manufacture or Supply) of the Institution of Gas Engineers. The Institution offers various grades of membership, listed in Appendix B, and various certificates in gas engineering, full details of which may be obtained from the Secretary at the Institution, 1, Grosvenor Place, London, S.W.1, from whom guidance on careers may be obtained. Corporate members of the Institution are described as chartered gas engineers.

Education for gas engineering may undergo changes in line with those proposed in the organisation of the industry. The Committee on the Gas Industry (*see* Committees Section) has made recommendations which seem to point to a wider separation of the functions of management from those of the professional engineer, when the industry is organised in larger regional units. The Institution of Gas Engineers has agreed to the introduction of an associate membership examination, and to proficiency tests in gas technology for technical personnel.

LOCOMOTIVE ENGINEERING

Locomotive Engineering, another branch of mechanical engineering, is concerned with design, research, supervision, management or administration for railway companies, firms of locomotive contractors, and makers of locomotive accessories. Apprentices must have received a good general education to School Certificate standard, and practical training of at least three years' duration; this may be obtained in the workshops of a firm of locomotive contractors or a railway company.

Membership of the Institution of Locomotive Engineers requires the qualifications which are listed in Appendix B. Further details of these and general information regarding forms of training may be obtained from the Secretary of the Institution.

MARINE ENGINEERING

Marine Engineering is the branch of mechanical engineering concerned with the machinery installed in ships. The personnel concerned includes engineer officers in the Royal Navy, engineers employed by shipping companies, by firms of marine engine builders and repairers, and engineers employed by Government departments, public undertakings, etc. The only branch coming within the scope of this article is that concerned with firms of marine engine builders and repairers, for which the scope includes design, development, administration, production and repair. The training is similar to that for mechanical engineers, but sea-going experience is an asset to design or development.

The chief centres of marine engineering are inevitably located in the shipbuilding regions, where facilities for higher technical education are provided in the universities and technical institutions. Early workshop training and technical education to the Ordinary National Certificate standard, however, may be obtained respectively in any heavy mechanical engineering works and technical college.

The Institute of Marine Engineers offers qualifications, listed in Appendix B. Further details should be obtained from the Secretary, or from the Secretary, Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow, C.2, or from the Secretary, North-East Coast Institution of Engineers and Shipbuilders, Bolbec Hall, Newcastle-on-Tyne.

MECHANICAL ENGINEERING

Mechanical Engineering is the largest of the main branches of the engineering profession, while a knowledge of mechanical engineering is essential for other professions in industry.

Practical training is recommended to precede full-time technical training, while some branches require special practical experience at a later stage. Professional qualifications offered by the Institution of Mechanical Engineers are listed in Appendix B.

The Institution of Mechanical Engineers has issued a report on training, in which it suggests that the teacher should become a practising engineer at regular intervals, and greater use be made of industrial refresher courses. It also believes that there should be wider provision for craft courses in technical colleges, and a certificate scheme on a national basis for craft students.

Mechanical engineers may obtain posts in the Admiralty, Post Office, Air Ministry, War Office and other Government departments, while in industry they may fill such posts as managing director, chief engineer, general manager, works manager, designer, research worker, consulting engineer, planning engineer, or inspector, or may become technical journalists, or lecturers or teachers.

MINING ENGINEERING

Mining engineers in the coal industry were usually employed by mining companies, but will now come under the National Coal Board. There are also openings as inspectors under the Ministry of Fuel and Power, in teaching and in technical journalism. Entry to the profession may be gained either by doing practical work underground for five years in a mine, with concurrent part-time study at a technical college, or by taking a university degree or diploma followed by practical training for three years; the latter period may be reduced by doing some of the practical work during vacations. Both types of students take the Certificate of Competency, issued by the Ministry of Fuel and Power to those who pass the examinations of the Board for Mining Examinations. The first class certificate is a qualification for management of mines, while the second class is needed for under-management. Professional status is granted by the Institution of Mining Engineers, of which particulars are given in the appendix. Further details may be obtained from the Secretary at Salisbury House, Finsbury Circus, London, E.C.2.

Those who wish to specialise in metalliferous mining should attend a course at one of the institutions specialising in metalliferous mining, i.e. the universities of Birmingham, Durham, Edinburgh, and Leeds, the Royal School of Mines in London, and the School of Metalliferous Mining at Camborne, Cornwall. Employment in various capacities is generally found with a mining company, as well as in inspection and teaching; most of the openings are to be found abroad.

Those wishing to specialise in oil prospecting and production should follow a university course in oil engineering, or a combination of geology and engineering. Post-graduate courses in oil exploration and exploitation are available at Birmingham. Professional status is granted by the Institute of Petroleum.

NAVAL ARCHITECTURE

The term Naval Architecture covers the design and construction of every kind of ship and vessel, from the largest battleship or Atlantic liner to the smallest coastal motor boat or harbour launch. A good general education

is required, and training, as for other engineering courses, is partly theoretical and partly practical, of which the former may be gained at a technical college or university, and the latter in a shipyard. Some experience in marine engineering works is advantageous. Ordinary and Higher National Certificate courses may be pursued in technical colleges in the shipbuilding regions, or degree courses at the universities of Glasgow, Liverpool and Durham (Newcastle Division).

His Majesty's ships are primarily designed by the Royal Corps of Naval Constructors, who undergo a three years' course at the Royal Naval College, Greenwich. Candidates must pass an entrance examination in mathematics, engineering science and practical knowledge of shipbuilding. Details may be obtained from the Secretary of the Admiralty (C.E. Branch).

The Institution of Naval Architects offers various grades of membership, listed in Appendix B, and awards and administers annually a number of scholarships in Naval Architecture and Marine Engineering. Full details may be obtained from the Secretary. Other bodies which offer membership are the Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow, C.2, and the North-East Coast Institution of Engineers and Shipbuilders, Bolbec Hall, Newcastle-on-Tyne.

PRODUCTION ENGINEERING

Production engineering is concerned with production generally, to organise manufacture on an economic basis, and its sphere includes chiefly works management, production management, planning, workshop layout, jig and tool design, estimating, time-study, rate fixing, motion study, inspection, purchasing and store-keeping.

Students should have varied workshop experience, followed by specialisation. Higher National Certificates may be taken, while some technical colleges offer "Post Higher" training. The Institution of Production Engineers offers qualifications which are listed in Appendix B. Details should be obtained from the Secretary.

RADIO ENGINEERING

Radio Engineering is a specialised branch of Physics. In a report on *Post-War Development in Radio Engineering*, with reference to education and training, the British Institution of Radio Engineers states that the radio industry offers better prospects than it did prior to 1939, and believes that the degree course facilities in physics and radio in the universities should be used, as well as courses of study in radio engineering and servicing in the technical colleges. It recommends the establishment of a nationally-recognised examination in radio science. The five main categories of workers in radio engineering that are distinguished are : (a) Senior research and other advanced workers drawn mainly from the universities ; (b) ancillary staff, recruited mainly from young persons aged 17 to 20 of an educational standard equivalent to the Higher School Certificate, and who study for the National Certificates with endorsement in radio engineering ; (c) technicians, recruited at the age of 16 and over with an educational qualification equivalent to matriculation, and who study for the City and Guilds of London Institute Certificate or the British Institution of Radio Engineers Graduateship examinations ; (d) skilled craftsmen, who work for the first certificate in

radio engineering, and the first two City and Guilds examinations in radio communications, the radio service examination of the City and Guilds of London Institute, and the certificate of the Radio Trades Examination Board; and (e) semi-skilled and unskilled labour.

Information regarding qualifications may be obtained from the Secretary of the British Institution of Radio Engineers, which also maintains a register of employers' and employees' requirements (*see* Appendix B).

Many radio manufacturers have their own trainee schemes, lasting three, four or five years, leading to National Certificates and City and Guilds of London Institute Certificates in 'technical electricity and radio communication'. It is estimated that some post-war employment may be anticipated in civil aviation for radio engineers, and there are opportunities for radio research in connection with navigation and other aids. The Institute of Aeronautical Engineers offers an optional paper on R.D.F.* work in its examination. The British Broadcasting Corporation conducts a training department for engineering staff already employed by the Corporation. The Radio Trades Examination Board, 9, Bedford Square, London, W.C.1, offers a radio servicing certificate for candidates of 17 years and upwards.

REFRIGERATING ENGINEERING

Refrigerating engineering is a branch of mechanical engineering which requires sound knowledge of the fundamentals of engineering, particularly of the theory of heat engines, and some interest in biological sciences. Employment may be found in the design and manufacture of refrigerating machinery, equipment and accessories, and in the construction of insulated space for cold storage of various types, as well as of air-conditioning plant (a branch of heating and ventilating engineering).

The student should obtain a qualification in mechanical engineering, then obtain employment with a firm specialising in his particular interest. Few courses are held in technical institutions. Details may be obtained from the Secretary, Institute of Refrigeration, which has a qualified membership class.

FUEL TECHNOLOGY

The fuel technologist is concerned with the use of fuel resources for heating, lighting and power, and the work includes production of fuel in the form in which it is to be used, and the efficient and economic use of fuels for providing power and heat. It is a profession which presents an increasing number of opportunities for scientists. Those specialising in coal technology may find employment with industrial firms, industrial research laboratories, electrical undertakings, the Fuel Research Board, the National Coal Board, the Ministry of Fuel and Power, firms of consulting engineers, or in teaching or technical journalism.

University training may consist of a chemical engineering course with post-graduate training in fuels, a mechanical engineering course followed by post-graduate work in fuel chemistry and technology, or a special course in fuel technology. Training for non-university students includes the Ordinary and Higher National Certificates in Mechanical or Electrical Engineering or Chemistry, or associate membership of a professional institution.

* Radio Direction Finding.

Those wishing to specialise in oil technology may take a degree course in oil engineering, chemical engineering, pure science followed by two years' post-graduate work in petroleum technology, mechanical engineering followed by post-graduate work in fuel chemistry and technology, or a special course in fuel technology. Non-university training consists in the Ordinary and Higher National Certificates in Mechanical or Electrical Engineering or Chemistry. Professional status is granted by the Institute of Petroleum.

The Regional Joint Education Committee of the Ministry of Fuel and Power and the Institute of Fuel are principally concerned with the development of facilities for training in all grades of fuel technology. Applicants should write to the Secretary of the Regional Joint Education Committee for the region in which he resides, or to the Education Committee of the Institute of Fuel, 18, Devonshire Street, London, W.1.

GLASS TECHNOLOGY

Training in glass technology consists in (a) Honours degree course leading to B.Sc. Tech. in Glass Technology; (b) Pass degree of B.Sc. Tech.; (c) Diploma in Glass Technology. These are available at the University of Sheffield, which also provides courses for post-graduate research and special summer courses. Local centre courses are conducted in the glass industry centres. Appointments may be obtained in factories or in research.

HOROLOGY

The horological industry, now being revived in Britain, is the first for which the Ministry of Education has established a National College, opening in September 1947 at the Northampton Polytechnic, London, to teach the subjects of horology and precision instruments.

The British Horological Institute has been responsible for promoting the development of technical training for craftsmen, and is the recognised examining body for the award of certificates in horological subjects. The Institute conducts correspondence courses in horological technology, and maintains an employment bureau. Details may be obtained from the Secretary, 35, Northampton Square, London, E.C.1. Specialist courses are conducted by firms concerned with this branch of industry, and by technical schools.

METALLURGY

Metallurgy deals with the application of the principles of chemistry and physics to metals and metallic processes. It covers the extraction of ores, their nature, properties, and behaviour, and the fabrication of metals. The two main branches of the profession are extraction metallurgy, covering all activities up to the production of the ingot or an equivalent stage, and physical metallurgy which deals with the study and treatment of metals after they have been produced in ingot or other form.

The Iron and Steel Institute, in its report on the Training of Metallurgists, describes the present great need for "men skilled in the science of metallurgy" and "knowledgeable in the art of working metals", to undertake research and development of the metallurgical industry, to fill responsible positions in production, and to be employed in the various metal

industries and in teaching. This report recommends the acquisition of a university degree, with work experience both before and during training. The course should include the study of basic scientific subjects, followed by specialisation in metallurgy. Thus a graduate in physics or chemistry should take a two years' post-graduate study of metallurgy. With reference to non-university training, the report states that there should be more extensive part-time facilities and its recommendation for the creation of a National Certificate in Metallurgy has been implemented.

Scope for metallurgists is to be found in the iron and steel works, in iron foundries, in the brass and copper trades, and in aluminium, nickel, zinc, tin and other light metals industries, as well as in specialised trades such as electric lamp and radio valve works, and in scientific instrument works.

The Councils of the Iron and Steel Institute and of the Institute of Metals have assisted in the establishment of the Institution of Metallurgists, which is a qualifying body, membership of which is dependent on evidence of suitable qualifications or on passing an examination. Information may be obtained from the Secretary, Institution of Metallurgists, 4, Grosvenor Gardens, London, S.W.1. The Institution also established an appointments register in January 1947, and inquiries should be sent to the Registrar, Appointments Register, at the above address.

A Joint Committee on Metallurgical Education has been formed by the Iron and Steel Institute, the Institution of Mining and Metallurgy, the Institute of British Foundrymen, the Institute of Metals and the Institution of Metallurgists, with the objects of co-ordinating the views of the Institutes and advising their Councils on the training of metallurgists and encouraging the extension of liaison between the universities, the metallurgical industries and the technical colleges. Further information and copies of its brochure, *Metallurgy—A Scientific Career in Industry*, can be obtained from the Secretary, 4, Grosvenor Gardens, London, S.W.1.

Particulars of the National Certificates in Metallurgy can be obtained from the Secretary, Joint Committee for National Certificates in Metallurgy, 4, Grosvenor Gardens, London, S.W.1.

The Institution of Mining and Metallurgy is a qualifying institution in respect of metals other than iron, and having a special reference to extraction processes up to and including the refining of metals. Information may be obtained from the Secretary, Salisbury House, Finsbury Circus, London, E.C.2.

The Institute of Welding offers various grades of membership which are listed in Appendix B.

The British Cast Iron Research Association is keenly interested in staff training and in releasing to industry both graduate and non-graduate staff suitable for technical and executive control. Young non-graduates are employed as laboratory assistants while training; they are expected to acquire a professional qualification by part-time study. Young men are also sent by members for training for a short or long period. The British Foundry School, which was founded on the initiative of the Association in 1935, closed at the outbreak of the war, but is reopening. Approximately 100 men holding responsible positions in the industry have been students of the School, ex-members of the British Cast Iron Research Association staff, or nominees of members trained by the Association. The Council envisages arrangements whereby regular movement of staff into industry and from

industry to the Association will take place, together with an extension of the above-mentioned plans for training the staff and representatives from industry.

The Institute of British Foundrymen has taken an active part in the provision of foundry technical education and has been instrumental in the establishment of classes at technical colleges in a large number of centres throughout the country. The Institute has also been instrumental in establishing the City and Guilds of London Institute examinations in Foundry Practice and Pattern-making, and endorses Ordinary and Higher National Certificates in Mechanical Engineering in respect of foundry subjects. It also endorses Higher National Certificates in Metallurgy in respect of those subjects.

OIL AND COLOUR CHEMISTRY

The Oil and Colour Chemists' Association has issued two reports* on technical education, in which recommendations are made to help the industry to attain a higher technical standard, to raise the status of chemists, to give guidance to the student, and to assist young chemists to continue their studies. The recommendations include an apprenticeship scheme for boys and girls who enter the industry at the age of 14 to 18, who should choose a works or laboratory apprenticeship.

The Association gives courses of post-graduate lectures.

PATENT AGENTS

The majority of those entering this profession have university degrees in science or engineering, or equivalent professional qualifications. The Intermediate examination of the Chartered Institute of Patent Agents is then taken after one year of service, and the Final after three years of service with a patent agent. The Register of Patent Agents bears only about 400 names and the annual entry was about 15 to 20 before the war.

In addition to qualified patent agents, there are technical assistants, who may later qualify as patent agents, and who have some qualification in engineering, physics or chemistry. Those who pass the final examination of the Institute are eligible for election to fellowship, and those who pass the intermediate examination are eligible for election to associateship.

Full details may be obtained from the Secretary, Chartered Institute of Patent Agents, Staple Inn Buildings, London, W.C.1.

PHYSICS

A university training is desirable for a physicist, but it may in some cases be taken on a part-time basis at a technical college by a student who may work as a laboratory assistant. A period of post-graduate research is a useful adjunct. Full professional status may also be reached by following a three-year part-time course at a recognised technical college, for the Ordinary and a further two years' course for the Higher National Certificates in Applied Physics.

* Oil and Colour Chemists' Association, 7, Whiteheads Grove, London, S.W.3. *First Report on Technical Education*, 1943. *Second Report on Technical Education: The Apprenticeship Scheme*, 1944. *Gratis*.

The Institute of Physics recommends that a student should follow a general university course in science before entering an honours school of physics, and that mathematics should be one of at least two other scientific subjects which should be studied. Those proposing to enter industry or Government service might take a course in the technique of physics applied to engineering or other industries, or a course in some technological subject, such as physical metallurgy or glass technology. An intending research physicist will need experience in research at a university, industrial establishment or some other centre, usually leading to a higher degree. The Institute also recommends, in its pamphlet *The Education and Training of Physicists* (1943), that the Ministry of Education should make available short advanced courses in both theoretical and experimental physics, suitable for men and women in industry or Government service. It considers that it should not be a primary function of technical colleges to educate students for external university degrees, while facilities for obtaining education at technical schools followed by advanced courses (full-time, sandwich and part-time) at technical colleges should be extended. Courses should be given in branches of technical physics on the lines of those provided for the National Certificates and Diplomas, while students at technical colleges should be enabled to obtain a recognised professional qualification in physics. Students in physics should have more direct contacts with industry. The National Certificate in Applied Physics meets some of these recommendations.

The Institute of Physics offers qualified membership to those with the necessary qualifications (*see* Appendix B). The Institute also maintains an appointments register, open to fellows, associates, students and prospective employers, as well as an advisory service for members and students. It also issues a Laboratory Arts Certificate to laboratory and technical assistants in physics and practical mathematics, simple wood and metal work, glass blowing, and laboratory organisation and technique. Details of these services may be obtained from the Secretary at the Institute.

The newly qualified physicist usually begins his career as an assistant in a works laboratory or in a development or research laboratory, and may ultimately proceed to a more responsible post. In a university he may begin as a demonstrator or junior lecturer. In the D.S.I.R. and other Government departments, or in research association laboratories he may begin as a junior scientific officer. There are also openings as meteorologists at the Air Ministry, in Colonial Service, as teachers, in the x-ray and radium departments of hospitals and in research laboratories.

Institutions such as Faraday House and some of the polytechnics provide full-time training in physics as applied to electrical and radio engineering, while laboratory experience and education on commercial apparatus is provided at the Marconi School, which accepts students from outside the firm.

The engineering applications of x-rays are divided into two main groups, according to the technique employed, namely radiography and x-ray crystal analysis. As a background to training in industrial radiography, some knowledge of science, particularly physics, up to at least matriculation standard, is desirable. During the war, however, training methods have made it possible to train intelligent students who lack that background. Courses of specialised training for industrial radiographers are held at the Kodak School of Industrial and Engineering Radiography and these are

designed to conform to the requirements of the authorities controlling radiological inspection. A course in the application of *x*-ray crystal analysis to industrial problems is also arranged from time to time, but it is stressed that most industrial *x*-ray crystal analysis is undertaken by physicists with research experience. Inquiries should be addressed to the Kodak School of Industrial and Engineering Radiography, Kodak Limited, Wealdstone, Harrow, Middlesex.

PLASTICS

The plastics industry, which is par excellence the product of modern scientific research, requires a wide range of qualifications in its personnel, including chemists, physicists and engineers, as well as craftsmen, administrators and designers.

The Institute of the Plastics Industry has launched a scheme to provide means to implement its education programme, the fund being administered by the Joint Executive Committee composed of members of the British Plastics Federation and the Institute of the Plastics Industry. Details of the Institute's membership grades appear in Appendix B. The Institute awards a diploma to the student of 16 years of age who has passed the City and Guilds of London Institute examinations in Plastics, stages I and II, and has attended a prescribed course of study.

The scheme of training for pupil apprentices developed by the Institute provides a systematic course of practical training in a works, supplemented by appropriate technical training, to equip youths entering the industry to become fully trained and to proceed to the higher positions in the industry. Names of firms with training facilities may be obtained from the Secretary of the Joint Executive Committee at the Institute of the Plastics Industry. A longer apprenticeship is arranged for boys of a lower educational standard, leading to certificates.

RUBBER TECHNOLOGY

The Institution of the Rubber Industry offers qualifying membership to chemists, physicists, and engineers in the rubber industry (*see* Appendix B). Training for the diplomas granted by the Institution can be carried out by full-time study at one of the recognised rubber trade schools situated in London, Manchester and Glasgow, or by part-time study under the guidance of a Fellow of the Institution. A scheme to assist part-time and full-time students with the cost of their studies has recently been established, and full-time scholarships leading to the Associateship, tenable at the Northern Polytechnic, Holloway, London, are now being offered annually to suitable candidates.

TEXTILE TECHNOLOGY

A university degree in textile technology may be taken at the universities located in the textile manufacturing regions (*see* Appendix A). The Textile Institute is the recognised professional body of the textile industry. Members may take an examination to qualify for associateship, and the Institute is empowered to grant certificates of competency in the practice, teaching or profession of textile technology. Associates and Fellows may style themselves "Textile Technologists". Full details may be obtained from the Secretary of the Institute (*see* Appendix B).

Technical colleges and schools in the textile manufacturing regions specialise in the various branches related to the types of manufacture undertaken in the district, and information should be sought from local colleges and education authorities. Furthermore, various branches of chemistry and engineering are closely related to the textile industry. Openings in textile technology include posts as industrial controllers, inside managers, textile designers, merchants, and research workers in universities, industry and the research associations.

The Textile Institute co-operates with the Ministry of Education on matters connected with technical training for textiles, and is jointly responsible, with the Ministry, for National and Higher National Certificates in Textiles. The Institute also awards scholarships, studentships and research grants, and organises annual competitions for design.

As soon as circumstances permit the British Cotton Industry Research Association is to offer a number of Shirley Scholarships for the training of young men for managerial positions in the industry. The "Trainee year" will have fixed dates of commencement and termination with a fixed course of lectures, demonstrations and laboratory work. Members of the Institute staff have been prominent as lecturers at Textile Society meetings and a successful experiment has latterly been tried of giving a series of special lectures to the technical staffs of member firms in the various textile districts. It is intended to develop this scheme and thus broaden the bridge between the Institute and the industry. It is also intended to strengthen the links between the Institute and the academic world by the offer of a number of external Shirley Fellowships.

TIMBER TECHNOLOGY

The Timber Development Association has collaborated with the Ministry of Education in the establishment of classes in local technical colleges and schools of commerce throughout the country for the training of students from the age of 16 years upwards in timber technology. It is intended to extend the 1945-46 programme, which included a three-year timber course in some 30 technical colleges and schools. Inquiries should be sent to the Secretary, C. T. Tobutt, 75, Cannon Street, London, E.C.4.

APPENDIX A.

UNIVERSITY COURSES IN PURE AND APPLIED SCIENCE.

<i>University</i>	<i>Courses</i>
ABERDEEN	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Natural Philosophy, Anatomy, Physiology, Zoology; Ordinary B.Sc. in Engineering; B.Sc. Engineering with Honours (Civil, Mechanical and Electrical).
BELFAST (Queen's University)	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Astronomy, Biochemistry, Botany, Chemistry, Experimental Physics, Geology, Mathematics, Mathematical Physics, Physiology, Zoology, Civil Engineering.
College of Technology	Pass and Honours B.Sc. in Electrical Engineering, Mechanical Engineering, Naval Architecture, Chemical Technology, Textile Technology.
BIRMINGHAM	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Anatomy, Botany, Chemistry, Geology, Mathematics, Mathematical Physics, Physics, Physiology, Zoology; Ordinary and Honours B.Sc. in Civil Engineering, Electrical Engineering, Mechanical Engineering, Oil Engineering and Refining, Oil Engineering with Geology, Industrial Fermentation, Metallurgy, Mining; Honours B.Sc. in Coal Utilisation; Apprenticeship courses in Electrical and Mechanical Engineering; Post-graduate Diplomas in Coal Mining, Malting and Brewing; Certificate in Malting and Brewing; Post-graduate courses in Oil Refining and Oilfield Engineering, Chemical Engineering, Mining.

University	Courses
BRISTOL	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Botany, Chemistry, General Science, Geology, Mathematics, Physics, Zoology ; Testamur in Bacteriology and Microbiology ; Ordinary and Honours B.Sc. in Civil, Electrical, Mechanical and Aeronautical Engineering ; Diploma in Engineering ; Post-graduate course in Structural Analysis,
CAMBRIDGE	Ordinary B.A. ; B.A. with Honours in Mathematics, Mechanical Sciences, Natural Sciences Triposes.
DURHAM (Durham Division)	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Physiology, Zoology.
DURHAM (King's College, Newcastle-on-Tyne)	Ordinary B.Sc. in Pure Science ; B.Sc. with General Honours in Pure Science ; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Physiology, Zoology ; Ordinary and Honours B.Sc. in Civil Engineering, Electrical Engineering, Mechanical Engineering, Marine Engineering, Fuel Technology, Metallurgy, Mining, Naval Architecture ; Diplomas in Mining.
EDINBURGH	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Biochemistry, Botany, Chemistry, Bacteriology, Geology, Mathematical Science, Physics, Physiology, Zoology ; Ordinary and Honours B.Sc. in Civil Engineering, Electrical Engineering, Mechanical Engineering ; Ordinary and Honours B.Sc. in Mining ; Ordinary and Honours B.Sc. in Technical Chemistry ; Post-graduate Diplomas in Technical Chemistry.
GLASGOW	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Astronomy, Biochemistry, Botany, Chemistry, Geology, Mathematics, Natural Philosophy, Physiology, Pathology with Bacteriology ; Zoology ; Ordinary and Honours B.Sc. in Applied Chemistry.
LEEDS	Ordinary B.Sc. in Pure Science ; B.Sc. with General Honours in Pure Science ; B.Sc. with Honours in Bacteriology, Biochemistry, Botany, Chemistry, Geology, Mathematics, Physics, Physics with Electrical Engineering, Physiology, Zoology ; Ordinary and Honours B.Sc. in Civil Engineering, Electrical Engineering, Mechanical Engineering, Mining Engineering, Gas Engineering, Fuel and Metallurgy, Chemistry of Leather Manufacture, Colour Chemistry and Dyeing, Textiles, Chemical Engineering, Metallurgy ; Ordinary B.Sc. in Dyeing ; Diplomas in Biology, Animal Biology, Civil Engineering, Colour Chemistry, Dyeing, Electrical Engineering, Fuel and Metallurgy, Gas Engineering, Leather Manufacture, Mechanical Engineering, Mining Engineering, Mining and Metallurgy, Textile Industries ; Post-graduate Diplomas in Chemical Engineering, Fuel and Metallurgy, Fuel and Refractory Materials, Fuel Technology, Gas Engineering.
LIVERPOOL	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Bacteriology, Botany, Biochemistry, Chemistry, General Science, Mathematics, Geology, Physics, Mathematical Physics, Physiology, Oceanography, Zoology ; B.Eng. in Civil Engineering, Electrical Engineering, Marine Engineering, Mechanical Engineering, Metallurgy, Metallurgical Engineering, Naval Architecture ; Certificate in Engineering ; Diploma in Engineering.
LONDON Bedford College	B.Sc. in Pure Science ; B.Sc. with Honours in Botany, Chemistry, Geography, Geology, Mathematics, Physics, Physiology, Psychology, Zoology.
Birkbeck College	Ordinary B.Sc. in Pure Science ; B.Sc. with Honours in Botany, Chemistry, Geography, Geology, Mathematics, Physics, Zoology.
Imperial College of Science and Techno- logy, including Royal College of Science, Royal School of Mines, and City and Guilds College.	The Imperial College is organised, under the three Colleges which form its integral parts, into departments as follows : Aeronautics (Aerodynamics, Aero-Structures and Aero-Engines) ; Botany with sub-departments of Plant Physiology, Plant Pathology, Bacteriology, Biochemistry ; Chemistry (Inorganic and Physical, and Organic, with sub-departments of Agricultural Chemistry, and the Chemistry of Food and Drugs) ; Engineering, Chemical and Applied Chemistry ; Engineering, Civil and Surveying ; Engineering, Electrical ; Engineering, Mechanical and Motive Power ; Geology (sub-departments of Mining Geology and Oil Technology) ; Mathematics and Mechanics ; Metallurgy ; Meteorology ; Mining (including Mining Surveying) ; Physics (sub-departments of Astrophysics, Technical Optics and Applied Geophysics) ; Zoology and Applied Entomology. Undergraduate Courses lead to Associateship of the Royal College of Science (A.R.C.S.), or Associateship of the Royal School of Mines (A.R.S.M.), or Associateship of the City and Guilds of London Institute (A.C.G.I.), also, where qualified, to B.Sc. (Special) or B.Sc. (Eng.) Degree, as the case may be. Post-graduate Courses lead to Diploma of Membership of the Imperial College (D.I.C.), and to higher Degrees.

<i>University</i>	<i>Courses</i>
King's College	B.Sc. (Special) and B.Sc. (General) degree courses for Pass or Honours in Botany, Chemistry, Geology, Mathematics, Physics, Zoology, Geography; B.Sc.(Eng.) (Honours or Pass) in Civil Engineering, Electrical Engineering, Mechanical Engineering; (Chemical Engineering discontinued); Diploma in Engineering; Certificate in Engineering, Chemical Engineering; Post-graduate courses in Civil, Electrical, Mechanical and Chemical Engineering.
Queen Mary College	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Biology, Botany, Chemistry, Geology, Mathematics, Physics, Zoology; Ordinary B.Sc.(Eng.); B.Sc.(Eng.) with Honours in Civil Engineering, Electrical Engineering, Mechanical Engineering, Aeronautical Engineering.
University College	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Zoology; Post-graduate Course in Engineering (Civil); Diploma in Chemical Engineering.
London External Degrees	B.Sc. General in three subjects; B.Sc. Special in Mathematics, Astronomy, Physics, Chemistry, Geology, Botany, Zoology, Physiology, Psychology, Anatomy, Anthropology, Geography, Statistics; B.Sc.(Eng.); B.Sc.(Eng.) (Mining); B.Sc.(Eng.) (Metallurgy).
MANCHESTER	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry Engineering, General Science, Geology, Mathematics, Metallurgy, Physics, Physiology, Zoology; Diploma in Bacteriology; Certificate in Engineering (Civil, Electrical, Mechanical), Mining; B.Sc.Tech. in Mining, Mechanical Engineering, Electrical Engineering, Municipal Engineering, Applied Chemistry, Textile Chemistry, Textile Industries, Building; Certificate in Technology, Mechanical Engineering, Electrical Engineering, Municipal Engineering, Applied Chemistry, Textile Chemistry, Textile Industries, Building; Post-graduate courses in Civil Engineering, Electrical Engineering, Mechanical Engineering, Geology and Mining, Metallurgy, Chemical Engineering, Electro-Chemistry, Steam Turbines, Machine Tools, Electrical Power Station Management, Design and Construction of Electrical Machinery, Textile Machinery, Municipal Engineering.
OXFORD	B.A. with Honours in Mathematics, Natural Science. (Astronomy, Botany, Chemistry, Engineering, Geology, Physics, Physiology, Zoology).
READING	B.Sc. (General) in Pure Science; B.Sc. (Special) with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Zoology.
ST. ANDREWS (and University College, Dundee)	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Astronomy, Biochemistry, Botany, Chemistry, Geology, Mathematics, Natural Philosophy, Physiology, Zoology; B.Sc. Engineering, Ordinary and Honours, in Civil Engineering, Electrical Engineering, Mechanical Engineering.
SHEFFIELD	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Anatomy, Botany, Chemistry, Geography, Geology, Mathematics, Physics, Physiology, Zoology; Certificate in Biology; Ordinary B.Eng. in Civil Engineering, Electrical Engineering, Mechanical Engineering, Mining, Fuel; B.Eng. with Honours in Civil Engineering, Electrical Engineering, Mechanical Engineering, Mining Engineering; Ordinary and Honours B.Sc.Tech. in Glass Technology; Associateship in Engineering; Diploma in Mining, Glass Technology; Ordinary and Honours B.Metallurgy in Ferrous, Non-Ferrous, or Foundry Metallurgy; Associate Course in Metallurgy Founding.
WALES	
University College of Wales, Aberystwyth	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Zoology.
University College of North Wales, Bangor	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry, Electrical Engineering, Mathematics, Physics, Zoology; Diploma in Biology, Electrical Engineering; Course on Electrical Communications.
University College of South Wales and Monmouth, Cardiff	Ordinary B.Sc. in Pure Science; B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Physiology, Zoology; Diploma in Biology, Engineering, Metallurgy, Metalliferous Mining; Ordinary Degree in Metallurgy, Fuel Technology, Civil Engineering, Electrical Engineering, Mechanical Engineering, Building, Metallurgy, Mining; Post-graduate course in Mining; Special Class in Metallography; Ordinary B.Sc. in Pure Science.
University College, Swansea	B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics; Ordinary and Honours B.Sc. in Metallurgy (Ferrous and Non-Ferrous Metallurgy, Fuel and Metallography); B.Sc. with Honours in Metallurgical Engineering; Ordinary and Honours B.Sc.Eng. in Civil Engineering, Electrical Engineering, Mechanical Engineering; B.A. with Honours in Mathematics; Diploma in Mathematical Physics.
UNIVERSITY COLLEGES: EXETER	Ordinary B.Sc. in Pure Science (London External); B.Sc. with Honours in Botany, Chemistry, Mathematics, Physics, Zoology (London External)

<i>University</i>	<i>Courses</i>
HULL	Ordinary B.Sc. in Pure Science (London External); B.Sc. with Honours in Botany, Chemistry, Mathematics, Physics, Zoology.
LEICESTER	Ordinary B.Sc. in Pure Science (London External); B.Sc. with Honours in Chemistry, Mathematics, Physics, Radio, Botany, Zoology (London External).
NOTTINGHAM	Ordinary B.Sc. in Pure Science (London External); B.Sc. with Honours in Botany, Chemistry, Geology, Mathematics, Physics, Physiology, Zoology; B.Sc. Engineering, Mining Engineering (London External); Diplomas in Civil Engineering, Electrical Engineering, Mechanical Engineering, Mining Engineering, Fuel Technology, Dyeing, Textiles, Technical Mycology; Higher Diploma in Dyeing, Textiles; Post-graduate course in Textile Chemistry; Courses in Chemistry and Microscopy of Foods and Drugs, Water Supply and Sewage Disposal, Chemical Engineering, Metallurgy; Courses for persons engaged in Chemical Works; Certificate in Mining, Mine Surveying.
SOUTHAMPTON	Ordinary B.Sc. in Pure Science (London External); B.Sc. with Honours in Botany, Chemistry, Geography, Mathematics, Physics, Zoology; B.Sc. Engineering (London External); Post-graduate Diploma in Electronics; Courses in Aeronautics, Air Navigation, Wireless Telegraphy and Telephony.

APPENDIX B.

INSTITUTIONS GRANTING PROFESSIONAL QUALIFICATIONS

AUTOMOBILE ENGINEERS, INSTITUTION OF, 12, HOBART PLACE, LONDON, S.W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	15-21	Engaged in course of training; Common Preliminary Examination or approved equivalent.
Probationary Graduate	21-26	Engaged in approved engineering training; Section A of the Associate Membership examination and must also pass Section B within three years of election.
Graduate	under 26	Engaged in approved engineering training and Sections A and B of the Associate Membership or other approved examination.
Post-graduate	over 24	Trained as engineer; knowledge of theory and practice of automobile engineering; associate membership or other approved examination.
Associate Member }	over 26	Trained as engineer; two years' responsible experience in science and practice of automobile engineering; engaged in automobile engineering; knowledge of theory and practice of automobile engineering; Associate Membership or other approved examination.
Member	over 33	Responsible position in practice of automobile engineering; thorough knowledge of theory and practice of automobile engineering, or in position of eminence in the industry. (Associate Members and Members are corporate members of the Institution and may style themselves "Chartered Automobile Engineers").

BREWING, INSTITUTE OF, BREWERS' HALL, ADDLE STREET, LONDON, E.C.2.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	under 21	Engaged in study of principles and practice of fermentation industries.
Corporate Member }		Companies, firms and individuals carrying on business as brewers, maltsters, distillers, etc.
Ordinary Member }		Persons who are associated directly or indirectly with the fermentation industries and who by reason of their position or qualifications or attainments are in the opinion of the Council able to further the objects of the Institute.
Associate Diploma		Associate examination; two years' practical brewing experience. Six years practical experience in brewing; Diploma examination.

CHEMICAL ENGINEERS, INSTITUTION OF, 56, VICTORIA STREET, LONDON, S.W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	16-25	Student in training for chemical engineering, or a pupil, apprentice or assistant under supervision of a corporate member, intending to become a corporate member; membership in this grade is limited to five years.
Graduate	over 20	Good general and scientific education and employed or being trained in chemical engineering; or approved examination in chemical engineering.
Associate Member }	over 25	(a) Associate or other approved examination; regular training and practical experience in direction or design of chemical engineering work.
	over 30	(b) B.Sc. in chemical engineering or equivalent; approved practical experience; responsible position as chemical engineer.
		(c) Position of eminence in the profession.
Member	over 32	(a) Good general and scientific education; regular training and practical experience as engineer; important position of independent responsibility in chemical engineering work. (b) Position of eminence in the profession.

CHEMISTRY, ROYAL INSTITUTE OF (OF GREAT BRITAIN AND IRELAND),
30, RUSSELL SQUARE, LONDON, W.C.1.

Full regulations regarding membership may be obtained from the Registrar.

ELECTRICAL ENGINEERS, INSTITUTION OF,
SAVOY PLACE, VICTORIA EMBANKMENT, LONDON, W.C.2.

Grade	Age of Entry	Qualifications and Examinations
Student	17-21	Students of electrical engineering at an approved college or an engineering pupil or apprentice under the supervision of a Corporate Member.
	21-28	Must also have satisfied the requirements of the Common Preliminary Examination.
Graduate	over 21	Passed Sections A and B of the Associate Membership Examination or obtained a university degree in electrical engineering or other accepted educational qualifications.
Associate	over 28	Five years' experience in a responsible position as an electrical engineer.
Associate } Associate } Member }	over 26	Qualified as a Graduate and either: (a) 5 years' technical education and training and at least 2 years' responsible experience as an electrical engineer.
Member	over 30	(b) At least 5 years in a responsible position as an electrical engineer.
	over 30	Must have been an Associate Member for at least three years and fulfilled other requirements such as experience in a position of superior responsibility

FUEL, INSTITUTE OF, 18, DEVONSHIRE STREET, LONDON, W.1.

Grade	Age of Entry	Qualifications and Examinations
Student	over 16	Attending approved university, college or school, or pupil, apprentice or assistant under supervision of a member
Associate	over 27	Interested in promotion of science or practice of fuel technology; approved experience.
Associate } Member }	over 25	Institute's examinations or approved equivalent; two years' training and one year's practical experience in fuel technology.
Member	over 33	Technically qualified in fuel technology; five years' experience; position of responsibility.
Fellow	over 35	Outstanding work in fuel technology.

GAS ENGINEERS, INSTITUTION OF, 1, GROSVENOR PLACE, LONDON, S.W.1.

Grade	Age of Entry	Qualifications and Examinations
Student	18-24	Ordinary grade Certificate of Institution, or equivalent; engaged in approved engineering training in gas industry or reading for B.Sc. degree in gas engineering.
Associate	over 21	Higher Grade Certificate of Institution, or equivalent.
Associate } Associate } Member }	over 21 (over 25 if not a student of Institution)	Higher Grade Certificate of Institution or equivalent; approved training of five years (unless student of Institution); responsible position as gas engineer.
Member		Responsible position as gas engineer and:
Member	over 30	(a) Diploma of Institution; or
		(b) Responsible engineering position for five years; Associate Member of Institution or Corporate Member of Institution of Civil Engineers or B.Sc. in Engineering; or
Member	over 30	(c) Suitable education and engineering training in gas industry; responsible position for fifteen years, and eminence in profession.

INDUSTRIAL ADMINISTRATION, INSTITUTE OF,
ARTILLERY HOUSE, ARTILLERY ROW, LONDON, S.W.1.

Grade	Age of Entry	Qualifications and Examinations
Student	17-25	Student of any industrial, commercial or allied subject.
Graduate	over 20	Institute's examinations.
Associate	over 22	Executive position for two years; Institute's Examinations.
Associate } Associate } Member }	over 25	Executive experience and administrative responsibility for three years; Institute's examinations.
Member	over 30	Administrative responsibility; Associate member for five years; Institute's examinations.
Fellow	over 30	High administrative responsibility.

LOCOMOTIVE ENGINEERS, INSTITUTION OF, 28, VICTORIA STREET, LONDON, S.W.1.

Grade	Age of Entry	Qualifications
Graduate	—	Good general education; engaged in technical and scientific training in locomotive engineering.
Associate } Member }	over 21	Ineligible for membership; good general and scientific education; regular training as mechanical engineer; engaged in and proficient in locomotive engineering.
Member	over 30	Good general and scientific education; regular training as mechanical engineer; experience in responsible position in locomotive engineering.

MARINE ENGINEERS, INSTITUTE OF, 85, MINORIES, LONDON, E.C.3.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	17-25	Engineering apprentice or student at approved institution; exemption from the Common Preliminary Examination of Engineering Joint Examination Board.
Graduate	20-30	Completed recognised training in engineering or shipbuilding; Section A of Associate Membership examination, or other approved examination.
Associate	—	(a) Board of Trade Certificate of Competence, university degree in engineering, or naval architecture, or equivalent.
Associate	over 30	(b) Position of responsibility in shipping, engineering, shipbuilding or allied industry for two years.
Associate	over 30	(c) Graduate of Institute, not qualified for corporate membership.
Associate } Member }	—	Associate membership examination; position of responsibility for two years in science and practice of marine engineering or shipbuilding; apprenticeship of five years or university degree; and two years' practical experience of engineering or naval architecture; Board of Trade Extra First Class Certificate of Competency or University degree (or diploma) and Board of Trade Certificate of Competency or Associate-Membership examination of Institute.
Companion	over 30	Position of eminence in shipping, engineering, shipbuilding or allied industry for at least five years, but ineligible for membership.
Member	over 30	(a) Board of Trade First Class Certificate of Competency or equivalent for five years and responsible position in science or practice of marine engineering. (b) Position of responsibility for at least five years in science or practice of marine engineering or shipbuilding, and an apprenticeship of five years or a university degree and two years' practical experience.

MECHANICAL ENGINEERS, INSTITUTION OF,
STOREY'S GATE, ST. JAMES'S PARK, LONDON, S.W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	over 16	Common Preliminary Examination or similar examination, and receiving or intending to receive regular training as mechanical engineer.
Associate } Member }	over 25	Associate Membership Examination or equivalent; regular training as mechanical engineer; practical experience.
Graduate	21-30	Sections A and B of Associate Membership examination or equivalent; regular training as mechanical engineer.
Member	over 33 (if associate member) over 35 (if not associate member)	Same as for Associate Membership, with position of responsibility in engineering science or practice; or position of eminence in engineering science or practice.

MINING AND METALLURGY, INSTITUTION OF,
SALISBURY HOUSE, FINSBURY CIRCUS, LONDON, E.C.2.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	over 18	Undergoing education and training as mining engineer or metallurgist.
Associate	over 25	(a) Graduate of Royal School of Mines or equivalent and two years' experience in mining or metallurgy; (b) Graduate of another school and three years' experience; (c) Six years' experience in mining or metallurgy.
Member	over 30	Five years in charge of mining or metallurgical operations, or in practice as consulting mining engineer or metallurgist; three years' regular training in pure or applied science; or outstanding contribution to Science or Technology.

MINING ENGINEERS, INSTITUTION OF,
SALISBURY HOUSE, FINSBURY CIRCUS, LONDON, E.C.2.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	under 25	Qualifying for profession of mining engineering.
Associate	over 25	Desires to promote science or practice of mining and holds approved position but ineligible for corporate membership.
Associate } Member }	over 23	(a) Intending to qualify as Member; approved examination; or (b) Contributed to advancement of science or practice of mining engineering.
Member	over 30	(a) Fully qualified mining engineer; statutory qualification of a colliery manager or equivalent; five years' responsible experience; or (b) Eminent position in science or technology.
Honorary } Member }	—	Distinguished by attainments or outstanding contribution to advancement of mining or other branches of technology.

NAVAL ARCHITECTS, INSTITUTION OF, 10, UPPER BELGRAVE STREET, LONDON, S.W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	18-25	Apprenticed articled pupil or student in naval architecture or marine engineering; good general education.
Associate Member }	over 25	University degree or suitable technical education; served apprenticeship or pupillage or approved mixed training of four years; professional employment approved by Institution; or civil or mechanical engineer employed for at least seven years in a shipbuilding yard or marine engineering works.
Member	over 30	Associate membership regulations, with position of primary responsibility for at least five years or seven years; or good general education, professional training, and ten years' employment in position of responsibility for design or execution of important shipbuilding or marine engineering work, with position of distinction in the profession.
Associate	over 25	Non-professional, but qualified by occupation to discuss with Naval Architects the qualities of a ship.

PHYSICS, INSTITUTE OF, 19, ALBEMARLE STREET, LONDON, W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	over 16	Good general education, student in physics at approved institution or pupil in approved laboratory or works.
Associate	over 21	(a) Good general education; recognised degree or diploma; one year's full-time experience in work demanding knowledge of physics under approved conditions. (b) Knowledge of physics equivalent to degree standard; three years' full-time experience in approved research or development work; evidence of initiative and originality.
Fellow		(a) Recognised degree or diploma and five years' full time approved research work, or responsible professional employment as physicist. (b) Outstanding contribution to physics.

PETROLEUM, INSTITUTE OF, PORTLAND PLACE, LONDON, W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	over 18	Good general education; following approved course of study leading to membership or fellowship of Institute.
Associate Member }	over 23	Ineligible for fellowship or membership, but connected with petroleum or allied industries.
Member	over 28	Good general education; either responsible position in petroleum industry for five years or qualified by position and attainments.
Fellow	over 28	Good general and scientific education; responsible position in science or technology of petroleum for five years; have advanced science and technology of petroleum or qualified by reason of position and attainments.

PLASTICS INDUSTRY, INSTITUTE OF THE,
WINDSOR HOUSE, VICTORIA STREET, LONDON, SW.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Ordinary Member }		Engaged in Plastics Industry.
Associate	over 25	Institute's Diploma Course; Associateship examination of Institute; three years' experience in the industry after diploma standard.
Fellow		Outstanding services to plastics industry.

PRODUCTION ENGINEERS, INSTITUTION OF, 36, PORTMAN SQUARE, LONDON, W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	16-25	Approved general education; practical training in production engineering; attending approved course of study.
Graduate	21-32	Practical training in production engineering; graduate examination of Institution or other approved examination.
Intermediate Associate Member }	over 28	Good general education; scientific and engineering training; engaged in production engineering for four years.
Associate Member }	over 28	Education and practical training as for membership, together with employment for four years in science and practice of engineering as applied to production and hold position of responsibility.
Member	over 33	Approved standard of education; served apprenticeship; position of independent responsibility in practice of engineering production.

RADIO ENGINEERS, BRITISH INSTITUTION OF, 9, BEDFORD SQUARE, LONDON, W.C.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	over 16	Good general education; registered student qualifying for the profession of radio engineering.
Graduate	over 18	Institution's graduateship examination; employed or trained in a branch of radio or allied engineering, or teacher of radio subjects undergoing a course of training.
Associate	over 21	Regular education in electronic knowledge and engaged for three years in radio or allied engineering; engaged in technical capacity in application or teaching of radio or allied engineering; Institution's graduateship or approved examination or thesis.
Associate } Member }	over 27	Trained and regularly engaged for five years as radio engineer; position of responsibility for three years or important research work; approved examination or paper or thesis; engaged in radio science.
Member	over 30	Regular education in electronic science and regularly engaged for seven years in technical capacity in radio or allied engineering; position of superior responsibility for five years and research or important work; scientific qualifications or Institution's examinations or approved thesis.
Companion	over 35	Important services to radio engineering, or high degree of responsibility in radio industry.

ROYAL AERONAUTICAL SOCIETY, 4, HAMILTON PLACE, LONDON, W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Student	18-25	Articled apprentices, pupils or assistants of Fellows, in R.A.F. or engineering firms, or in approved college of engineering or science; training for profession of aeronautics; Common preliminary examination of Engineering Joint Examination Board or approved equivalent.
Graduate	21-28	Associate Fellowship examination or equivalent; approved training for profession of aeronautics.
Associate	over 25	Engaged in work on or connected with aircraft; ground engineer's certificate in at least three categories, or position as inspector or examiner of materials for three years, or Pilot's "B" licence or Navigator's certificate, or commissioned or warrant rank in R.A.F. for three years, or position equivalent to that of foreman in aero works for three years.
Associate } Fellow }	over 25	(a) Engaged in design or construction in profession of aeronautics, or in application to aeronautics of special branches of science, mathematics or engineering, or in development of science of aeronautics, or as teacher of aeronautics; Associate Fellowship examination or equivalent; five years' experience in aeronautics.
Associate } Fellow }	over 40 or over 28	(b) 15 years' experience; position of responsibility; Associate Fellowship examination or equivalent.
Fellow		Fulfil conditions of Associate Fellowship; five years in position of responsibility; eminence in profession of aeronautics.

RUBBER INDUSTRY, INSTITUTION OF, 12, WHITEHALL, LONDON, S.W.1.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Licentiate	over 19	Students in approved training; Institution's examination.
Associate	over 21	Higher degree of a University, or F.R.I.C., in subject of Rubber Technology; or by examination.
Fellow	over 30	Associate of five years' standing, ten years' experience in rubber industry, research or inventions and responsible position.
Fellow	—	Non-Associate, in exceptional cases as recognition of eminent and distinguished service to the industry, by invitation from the General Council.

TEXTILE INSTITUTE, 16, ST. MARY'S PARSONAGE, MANCHESTER, 3.

<i>Grade</i>	<i>Age of Entry</i>	<i>Qualifications and Examinations</i>
Associateship	25	(a) Graduate in textile technology in approved institution, or equivalent examination; two years' experience in responsible direction and control of textile work. (b) School certificate or Institute's Preliminary Examination; special qualification in one branch of textile technology; Institute's examination in General Textile Technology; and two years' experience in responsible direction and control of textile work. (c) Approved university degree; special knowledge of one branch of textile technology; Institute's Examination in General Textile Technology; and two years' experience in responsible direction and control of textile work.
Fellowship	28	(a) Three years' approved occupation in the practice, teaching or profession of Textile Technology since election to Associateship; and made a substantial contribution to the advancement of knowledge relating to the Textile Industries. (b) Three years' approved occupation in the practice, teaching or profession of Textile Technology since election to Associateship; training in textile technology equivalent to that of Associate; and made a substantial contribution to the advancement of knowledge relating to the Textile Industries.

WELDING, INSTITUTE OF,
2, BUCKINGHAM PALACE GARDENS, BUCKINGHAM PALACE ROAD, LONDON, S.W.1.

Grade	Age of Entry	Qualifications and Examinations
Student	under 25 (cannot remain after 28)	Passed Common Preliminary of Engineering Joint Examination Board or exempting examination.
Associate	—	Skilled welder who satisfied Council as to proficiency and continuous experience over five years; or has completed a full course in principles and practice of welding at an approved institution and has had three years' continuous practical experience.
Graduate	21-28 (cannot remain after 30)	(a) Making progress to qualify for A.M. having passed prescribed sections of A.M. examination or obtained exemption; and received or receiving training for responsible post, practical, technical or scientific; or (b) Student who has not qualified for A.M. or Associate, on reaching age of 28.
Companion } Member }	—	Non-technical, having contributed to development and holding senior position of responsibility in use of welding or manufacture of supplies.
Associate } Member }	over 25	Engaged in technical or scientific capacity in use of welding or manufacture of supplies for five years minimum; passed examination or been exempted; holding subordinate executive or other position of technical or scientific responsibility in use of welding, or manufacture of supplies. (Research and teaching appointments recognised; Commission in Technical Branch of Forces recognised; Thesis may be accepted in lieu of examination).
Member	over 30	(a) Associate Member qualified under these by-laws, holding for sufficient period important position of technical or scientific responsibility in use of welding or manufacture of supplies.
Member	over 35	(b) Educational qualifications equal to A.M. and holding important position as above for five years minimum. (Research and teaching appointments recognised).
Fellow	—	Of scientific or technical eminence in recognition of distinguished contributions to science or practice of welding.
Industrial } Corporate } Members }		Class I: Company or Firm interested in welding methods, means and processes. Class II: A Trade Association or Classification Society.

APPENDIX C.

CITY AND GUILDS OF LONDON INSTITUTE, DEPARTMENT OF TECHNOLOGY, 31, BRECHIN PLACE, SOUTH KENSINGTON, LONDON, S.W.7.

Certificates in Chemical, Metallurgical and Allied Subjects :

Paper Manufacture; Soap Manufacture; Brewing; Coal Processing, comprising Coke and By-Products Manufacture, Coal Tar Distillation and Crude Intermediate Products Manufacture, Low Temperature Carbonisation, and Hydrogenation of Coal and Oils; Intermediate Products for Dyes and Colouring Matters; Petroleum and Petroleum Products; Sugar Manufacture; Manufacture and Technology of Pigments, Paints and Varnishes (including a part-time course in Methods of Investigation in Paint Technology); The Technology and Chemistry of Oils, Fats and Waxes; Technology of Plastics; Technology of Gas Manufacture and Supply; Gas Fitting; The Principles and Practice of Metallurgical Operations; Operatives' Course in Iron and Steel Manufacture; Operatives' Course in the Manufacture and Treatment of Non-Ferrous Metals and Alloys; Electrodeposition of Metals; Leather Manufacture (Tanning and Dressing of Heavy and Light Leather); Leather Dyeing and Finishing; The Dyeing of Silk and Rayon and Associated Fibres; The Dyeing of Wool and Associated Fibres; The Dyeing of Cotton and Associated Fibres; Textile Printing; Fuel Technology.

Certificates in Electrical Subjects :

Electrical Installation Work; Electrical Engineering Practice; Radio Service Work; Telecommunications, Engineering, comprising Mathematics for Telecommunications, Telecommunications (Principles), Elementary Telecommunications Practice, Telephone Exchange Systems, Telegraphy, Radio, Lines Plant Practice, and Line Transmission.

Certificates in Mechanical Engineering and Allied Subjects :

Machine Design; Patternmaking; Foundry Practice and Science; Machine Shop Engineering (Machinists', Turners' and Fitters' Work); Mechanical Engineers' Estimates and Specifications; Boiler Makers' Work; Metal Plate Work; Railway Carriage and Wagon Construction; Automobile Engineering Practice, comprising Motor Vehicle Service Mechanics' Work, Motor Vehicle Service Technicians' Work, Motor Vehicle Electricians' Course, and Final Examination in Motor Vehicle Technology; Private Motor Body Work; Commercial Motor Body Work; Iron and Steel Shipbuilding and Naval Architecture; Ship Joinery; Aeronautical Engineering Practice; Principles of Electric-Arc and Oxy-Acetylene Welding; Boiler House Practice; Refrigeration Practice; Science and Technology of Refrigeration.

Certificates in Textile Subjects :

Woollen and Worsted Manufactures, comprising Raw Materials, Wool-combing, Worsted Spinning, Woollen Yarn Manufacture and Woollen and Worsted Weaving; Cotton Spinning; Plain Cotton Weaving; Cotton Manufacture (Weaving); Flax Spinning; Linen Weaving; Silk and Rayon Manufacture, comprising Silk and Rayon Throwing and Spinning, Silk and Rayon Weaving, Silk and Rayon Knitting and Hosiery, Silk and Rayon Dyeing and Finishing, and Silk and Rayon Designing; Jute Manufacture, comprising Jute Spinning and Jute Weaving; Manufacture of Hosiery and Knitted Goods; Mill Engineering and Services; Industrial Organisation; Chemistry as Applied to the Textile Industry; Appreciation of Colour and Design for Producers.

APPENDIX D.

National Certificates :

<i>Subject</i>	<i>Professional Bodies associated with the Ministry of Education</i>
Applied Physics	Institute of Physics
Building	Institute of Builders
Chemistry	Royal Institute of Chemistry
Civil Engineering	Institution of Civil Engineers
Commerce	Association of British Chambers of Commerce
Craftsmen's Certificate for a Motor Vehicle Service Mechanic	National Joint Industrial Council
Electrical Engineering ..	Institution of Electrical Engineers
Mechanical Engineering ..	Institution of Mechanical Engineers
Metallurgy	Iron and Steel Institute
	Institution of Mining and Metallurgy
	Institute of Metals
Naval Architecture ..	Institution of Naval Architects
	Worshipful Company of Shipwrights
Production Engineering ..	Institution of Mechanical Engineers
	Institution of Production Engineers
Textiles	Textile Institute
(In Production Engineering and Civil Engineering only Higher National Certificates are awarded)	

National Diplomas :

Building
Electrical Engineering
Mechanical Engineering

APPENDIX E.

GRANTS FOR INDUSTRIAL RESEARCH*

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
QUEEN'S UNIVERSITY, BELFAST	£200	Musgrave Research Studentships (3) for research in Pathology, Biology, Chemistry, Physics and Physiology. Tenable: Queen's University; 1 year.	The Secretary, Queen's University, Belfast.
BIRMINGHAM UNIVERSITY	£250	James Watt Research Fellowship in Mechanical Engineering. Tenable: Birmingham University; 1-2 years.	The Registrar, Birmingham University.
	£250	William Gibbins Research Fellowship for research into copper, brass and non-ferrous alloys consisting mainly of copper, especially alloys of interest to the non-ferrous metallurgical industries. Tenable: Birmingham University; 2 or more years.	ditto
	£240-300	Research Studentship in Oil Engineering and Refining. Tenable: Birmingham University; 1-4 years.	ditto
	£200-400 or more	Nuffield Research Fellowship for research in physics. Tenable: Birmingham University 2 or more years.	ditto
	£300	G.E.C. Research Fellowship for research in electrical engineering by university men with industrial experience. Tenable: Birmingham University 1 or more years.	ditto
	£150	G.E.C. Research Scholarships (2 are provided if above Fellowship is not awarded) for research in electrical engineering. Tenable: Birmingham University; 1 year.	ditto

* Awards made by universities to their own members are not included and information should be sought from the appropriate university.

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
BRISTOL UNIVERSITY	£200	Arthur Prince Chattock Research Studentship in Physics. Tenable: Bristol University; 2 or more years.	The Registrar, Bristol University.
	£300	George Wills Research Associateships in Physics (3). Tenable: Bristol University; variable period.	ditto
	£200	Michael Hiatt Baker Scholarship. Tenable: Bristol University by graduates from New Zealand; 2-3 years.	ditto
BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION	£200	Shirley Fellowships for training young men in research methods in pure science, especially those branches of prime interest to the Association. Tenable: at a British University; 2 years.	Director, British Cotton Industry Research Assoc- iation, Shirley Institute, Dids- bury, Manchester
BRITISH COUNCIL	—	Scholarships for post-graduate study offered by Governments of foreign countries for British students. Scholarships for overseas students for study in British universities. Tenable: 1 year.	British Council, 3 Hanover Street, London, W.1.
BRITISH FEDERATION OF UNIVERSITY WOMEN	—	Travelling and other Fellowships. Tenable: women only.	The Secretary, British Federa- tion of University Women, 17a, King's Road, London, S.W.3.
BRITISH IRON AND STEEL RESEARCH ASSOCIATION	£150-300	Post-graduate Bursaries for advancement of knowledge related to production or processing of iron and steel, for a higher degree in metallurgy, physics, chemistry or engineering.	The Secretary, British Iron and Steel Research Association, 11, Park Lane, Lon- don, W.1.
BRITISH NON-FERROUS METALS ASSOCIATION	—	Bursaries for graduates in metallurgy, chemistry, physics and engineering. Tenable: 2 years.	British Non-Ferr- ous Metals Association, Euston Street, London, N.W.1.
BRITISH RUBBER PRODUCERS' RESEARCH ASSOCIATION	£350-250	Scholarships (2) for research trainees.	British Rubber Producers' Research Association, 19, Fenchurch Street, London, E.C.3.
BUSK TRUSTEES	£150	Busk Studentship in Aeronautics for research in aeronautics, especially in subjects such as stability problems, meteorological questions bearing on flight or the investigation of gusts, treated either experimentally or mathematically. Tenable: at home or abroad; 1 year.	Professor Sir Melvill Jones, Engineering Laboratory, Cambridge.
CAMBRIDGE UNIVERSITY	£300	Research Studentship in Polymerisation. Tenable: Department of Physical Chemistry, University of Cambridge, by honours graduates in chemistry; 1-3 years.	The Secretary, University Department of Physical Chem- istry, Free School Lane, Cambridge
CAMBRIDGE UNIVERSITY	£300	Balfour Studentship for research in biology, especially animal morphology. Tenable: men only; 3 years, of which 3 terms are spent at Cambridge.	The Registry, University of Cambridge.
CAMBRIDGE UNIVERSITY (Trinity College)	£300	Research Studentship. Tenable: Trinity College; open to graduates of other universities; 2-3 years.	The Senior Tutor, Trinity College, Cambridge.
CAMBRIDGE UNIVERSITY (St. John's College)	£300	Strathcona Research Studentships (3 or more) in any branch of study. Tenable: St. John's College, by graduates of any university; men only; 1-2 years.	The Senior Tutor, St. John's College, Cambridge.
	£200	Philip Baylis Studentship for mathematics. Tenable: St. John's College, by graduates of any university; 1 year.	ditto

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
CAMBRIDGE UNIVERSITY (Pembroke College)	£425	Stokes Studentship for research in physics or cognate subjects. Tenable: by graduates preferably of Cambridge; 3-5 years.	The Master, Pembroke College, Cambridge.
CAMBRIDGE UNIVERSITY (Gonville and Caius College)	£150	Rhondda Studentships (2) for any branch of recognised study. Tenable: by residents or sons of residents in Wales; men only; 2-3 years.	Gonville and Caius College, Cambridge.
CARNEGIE TRUST		Fellowships and Scholarships to enable British graduates of Scottish universities to investigate some problem or factor of modern civilisation (including science and medical research).	The Secretary, Carnegie Trust, Merchant's Hall, Hanover Street, Edinburgh.
CHADWICK TRUSTEES	£150-400	Travelling Scholarships for research in sanitary science and hygiene. Tenable: abroad; 1 year or more.	The Clerk, Chadwick Trustees, 204, Abbey House, London, S.W.1.
CHEMICAL SOCIETY	—	Grants from Research Fund.	The Secretary, Burlington House Piccadilly, London, W.1.
COMMONWEALTH FUND	\$3,500	Fellowships for study in some branch of knowledge (including science) of a university in U.S.A. Tenable: men only, 1 year.	The Secretary, Commonwealth Fund Committee, 35, Portman Square, London, W.1.
D.S.I.R.	£300	Senior Research Awards for young investigators who have shown exceptional aptitude for original research. Tenable: at any approved institution preferably in Great Britain; 3 years.	See "Notes on Grants to Research Workers and Students" H.M.S.O.
EDINBURGH UNIVERSITY	£200	Shaw Macfie Lang Fellowship awarded in a subject decided by the Senate to an honours graduate of a Scottish University. Tenable: 2 years.	The Secretary, Matriculation Office, University of Edinburgh.
ELECTRICAL ASSOCIATION FOR WOMEN	£500	Travelling Scholarships.	The Secretary, Electrical Association for Women, 20, Regent Street, London, S.W.1.
ELECTRICAL ENGINEERS, INSTITUTION OF	£250 £250 £120 £100	Ferranti Research Scholarship. Oliver Lodge Scholarship. Swan Memorial Scholarship; 1 year. War Thanksgiving Education and Research Fund.	The Secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.
ENGLISH ELECTRIC CO.	£200	Bursaries in Hydro-Electric Engineering. Tenable: Imperial College of Science and Technology; 1 year.	The Dean, City and Guilds College, Exhibition Road, London, S.W.7.
GAS, LIGHT AND COKE CO.		Gas Research Fellowship. Tenable: Imperial College of Science and Technology.	Gas, Light and Coke Co., 30, Kensington Church Street, London, W.8.
GAS RESEARCH BOARD		Post-graduate Research Grants.	Gas Research Board, 1, Grosvenor Place, London, S.W.1.
GLASS DELEGACY, UNIVERSITY OF SHEFFIELD	£150-200	Post-graduate Research Fellowships. Tenable: 2 years.	Glass Delegacy, Elmfield, Northumberland Road, Sheffield, 10.

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
GOLDSMITHS' COMPANY		Senior Studentships. Tenable: by graduates of Oxford and Cambridge (first or second class honours).	The Clerk, Goldsmiths' Hall, London, E.C.2.
HENRY FUND	£600	Fellowships (4) for post-graduate study. Tenable; Harvard or Yale University; 1 year.	The Secretary, Henry Fund Trustees, c/o Oxford University Chest, Oxford.
IMPERIAL CHEMICAL INDUSTRIES, LTD.	£600	Fellowships (80) for research in physics, chemistry and allied subjects. Tenable: Oxford, Cambridge, London, Glasgow, Edinburgh, Manchester, Birmingham, Leeds, Liverpool and Durham universities; 5 years.	Authorities of universities concerned.
IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY LONDON	£300	Beit Fellowships (3) for scientific research. Tenable: Imperial College; 1-2 years.	Registrar, Imperial College South Kensington, London, S.W.7.
	£200	Henry George Plimmer Fellowship for research in morbid anatomy, histological anatomy, chemical pathology, protozoology, bacteriology and allied subjects in either zoology, medicine, or botany. Tenable: under general supervision of Biological Department of Imperial College at any recognised institution at home or abroad; 1-2 years or longer.	
	£200	Bursaries in Concrete Technology (11) for post-graduate study in the Concrete Technology Section of the Department of Civil Engineering of the College; open to graduates in Engineering of a British university; 1-2 years.	
LEEDS UNIVERSITY	£350	Gas Research Fellowship for research in subjects connected with the chemistry of gases and combustion; preference to candidates intending to enter Coal Gas Industry. Tenable: University of Leeds; 1 or more years.	The Registrar, University of Leeds.
	£150	James Edmondson Ackroyd Fellowship for research on subjects bearing upon the production of wool, silk or other textile materials, or the manufacture of textile fabrics; open to graduates of any university but preference may be given to natives or residents of Bradford. Tenable: University of Leeds; 3-6 years.	ditto
	£160	Clothworkers' Company Fellowships for research in subjects connected with the textile industry or with colour chemistry and dyeing. Tenable: University of Leeds; 1 or more years.	ditto
	£300	Ellison Senior Fellowship for research in chemistry (pure and applied) and in physics; open to trained research workers. Tenable: University of Leeds; 1-3 years.	ditto
	adjusted to individual requirements	For senior workers who are prevented by routine duties from undertaking or completing valuable research. Tenable: up to 2 years.	The Secretary, Leverhulme Research Fellowships, 7, Bedford Row, London, W.C.1.
LINEN INDUSTRY RESEARCH ASSOCIATION	£120-160	Research Studentships.	The Research Institute, Lambeg, Lisburn, Co. Antrim, N. Ireland.
LONDON COUNTY COUNCIL	£450	Robert Blair Fellowships (2) for advanced research or study in applied science and technology. Tenable: in Dominions, U.S.A., or other foreign country; 1 year.	The Education Officer, County Hall, London, S.E.1.

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
LONDON UNIVERSITY	£250	Leverhulme Studentship in chemical engineering. Tenable: King's College; 1-2 years.	The Secretary, King's College, Strand, London, W.C.2.
	£200	Keddey Fletcher-Warr Studentship for post-graduate research in science. Tenable: approved institution in British Isles or abroad; 3 years or more.	Academic Registrar, London University, London, W.C.1.
	£400	Leon Fellowship for advanced research in any subject (preferably economics or education). Tenable: 1-2 years.	ditto
INTERNATIONAL WOOL SECRETARIAT MANCHESTER UNIVERSITY	£300	Wool Research Scholarship. Tenable: Manchester University; 1 year or longer.	The Registrar, University of Manchester.
	£200	John Harling Fellowship in Physics for the encouragement of study and research in physical science. Tenable: University of Manchester; 1-3 years.	ditto
	£200	Grisedale Scholarship for biological research in botany or zoology. Tenable: University of Manchester (part time may be spent elsewhere); 1-2 years.	ditto
	£200	Osborne Reynolds Research Fellowship for research in engineering or related sciences. Tenable: University of Manchester or other approved institution; 1 year or longer.	ditto
	£200	Joseph Roberts Greatorex Scholarship in Engineering for advanced research in engineering. Tenable: University of Manchester (or elsewhere for Manchester graduates); 1-2 years.	ditto
	£200	Sir Clement Royds Memorial Scholarship for advanced study and research in chemistry. Tenable: by British subjects of British descent born in or inhabitants of Lancashire, with preference to those born in or inhabitants of Rochdale. Tenable: University of Manchester; 1-3 years.	ditto
NAVAL ARCHITECTS, INSTITUTION OF	£500	Royal Commission for the Exhibition of 1851 Scholarship for post-graduate research in problems connected with the design and construction of ships, machinery or equipment, or for study of developments in shipbuilding and allied industry. Tenable: at home or overseas; 2 years.	The Secretary, Institution of Naval Architects, 10, Upper Belgrave Street, London, S.W.1.
	£150	Sir William White Scholarship for post-graduate research in naval architecture and marine engineering. Tenable: at an approved institution; 2 years.	ditto
	£400	Wrought Light Alloys Development Association Scholarship for research in the application of light alloys to ship construction. Tenable: at an approved university, institution, shipyard or works; 2 years.	ditto
NUFFIELD FOUNDATION	£500	Travelling Fellowships (5) for members of teaching staffs of universities and approved schools of mines and metallurgy within the Commonwealth and Empire. Tenable up to 3 months.	The Secretary, Nuffield Foundation, 12-13, Mecklenburgh Square, London, W.C.1.
	£500	Travelling Post-graduate Scholarships (5) for graduates of universities and approved schools of mines and metallurgy in the Commonwealth and Empire and who have specialised in extraction metallurgy. Tenable: 6 months.	ditto
OXFORD UNIVERSITY	£300	Resident Research Fellowship for research in any branch of study. Tenable: at Lady Margaret Hall by graduates of any university; 3 years or longer; women only.	The Principal, Lady Margaret Hall, Oxford.
	£150	Susette Taylor Annual Fellowship for research abroad in any subject. Tenable: graduates of any university; women only; 1 year.	ditto
	£250	Lady Carlisle Research Fellowship for research in classics, classical archaeology, philosophy, history, economics, natural science or mathematics. Tenable: Somerville College; women only; 5-10 years.	The Secretary, Somerville College, Oxford.

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
RAMSAY MEMORIAL FELLOWSHIPS	£300-350	Ramsay Fellowship for original research in pure or applied chemistry. Tenable: at an approved institution generally within the British Empire by candidates educated in Glasgow; 2-3 years.	The Secretary, Ramsay Memorial Fellowship Trust, University College, Gower Street, London, W.C.1.
	£300 plus expenses	Glasgow Fellowship for original research in pure or applied chemistry. Tenable: within or outside British Empire by students of university of Glasgow or of Royal Technical College, Glasgow; 2-3 years.	ditto
RHODES TRUSTEES	£400	Rhodes Scholarships (60-70) to enable students from the Dominions and U.S.A. to study at the University of Oxford for an honours or research degree. Tenable: 2 years at Oxford and a third year at Oxford or elsewhere.	The Secretary to Rhodes Trustees, 36, Beaumont Street, Oxford.
ROYAL COMMISSION FOR THE EXHIBITION OF 1851	£550	Senior Studentships (4) for original research in pure or applied science. Tenable: at home or abroad; 2-3 years.	The Secretary to the Commissioners, 1, Lowther Gardens, Exhibi- tion Road, London, S.W.7.
	£400 plus expenses	Overseas Scholarships (10) for further training of Dominion and Indian students in methods of research (in pure or applied science) in an institution outside their own country; 2-3 years.	
	£250	Post-graduate Scholarship in Naval Architecture. Tenable: 2 years.	The Secretary, Institution of Naval Architects, 10, Upper Belgrave Street, London, S.W.1.
ROYAL INSTITUTION	£400	Dewar Research Fellowship for furtherance of research in some branch of science. Tenable: Royal Institution; 3-5 years.	The General Secretary, Royal Institution, 21, Albemarle Street, London, W.1.
ROYAL SOCIETY	£900	Smithson Research Fellowship for research in natural science with a view to the discovery of new laws and principles. Tenable: Cambridge University; 4 years.	Assistant Secretary Royal Society, Burlington House, London, W.1.
	£800	Sorby Research Fellowship for original research in any branch of science. Tenable: normally at University of Sheffield; 5 years.	ditto
	£500	Warren Research Fellowships (2 or more) for research in metallurgy, engineering, physics and chemistry. Tenable: 4-7 years.	ditto
		Mackinnon Research Studentship for furtherance of natural and physical science. Regulations under revision.	ditto
		Moseley Research Studentship (2) for furtherance of experimental research in pathology, physics and chemistry, but not in pure mathematics, astronomy or any branch of science which aims at describing, cataloguing or systematising.	ditto
		Government Grants for Scientific Investigations for promoting and support of scientific research and for the assistance of scientific expeditions and collections.	ditto
SHEFFIELD UNIVERSITY	£150	Ironmongers' Company Research Scholarships (2) for research in the cold-working of steel and other ferrous metals. Tenable: at Sheffield University or abroad if renewed beyond a second year; preferably by candidates with special qualifications in physics and engineering respectively; 1-4 years.	The Registrar, Sheffield University.
	£500	Ironmongers' Company Research Fellowship for research in the cold-working of steel and other ferrous metals. Tenable: by candidates with experience of metallurgical research.	ditto

<i>Institution</i>	<i>Value Per Annum</i>	<i>Grants</i>	<i>Further Information From</i>
SIR JAMES CAIRD TRUST	£200-600	Senior Travelling Scholarships (3) to enable graduates who are natives of Scotland to carry out research in engineering, electricity, aeronautics and allied subjects. Tenable: at approved institution at home or abroad; 1-3 years.	John Pearson, Solicitor, 7, Ward Road, Dundee.
SOUTHAMPTON UNIVERSITY COLLEGE	£150	Research Scholarships in any branch of study. Tenable: 2-3 years.	The Registrar, University College, Southampton.
TURNER AND NEWALL, LTD.	£600	Fellowships (8) for research in engineering, inorganic chemistry or physics, or allied sciences. Tenable: Manchester, London, Leeds, and Durham Universities; 5 years.	The Universities concerned.
WATFORD CHEMICAL CO., LTD.	£325	Post-graduate Research Scholarships (1-2). Tenable: London University. Minor research grants at Cambridge, etc.	Watford Chemical Co., Ltd., 30, Baker Street, London, W.1.

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SCOPE AND FUNCTIONS

With the exceptions of medicine and agriculture, which are dealt with by the Medical Research Council and the Agricultural Research Council respectively, for which also the Lord President is responsible, the D.S.I.R. embraces in its scope all branches of natural science and their application to industrial processes, including the storage and processing of foodstuffs and the utilisation of timber. Within its scope the Department's activities are broadly as follows : (1) Research in the national interest for the benefit of the community and to meet the requirements of the Government ; (2) the encouragement of industrial research and the application of scientific knowledge in industry ; (3) the encouragement, as a main source of new knowledge, of fundamental research at the universities and elsewhere and the maintenance of an adequate supply of trained research workers for laboratories of all kinds.

NATIONAL RESEARCH. To discharge the first of these functions the Department maintains ten establishments under its own control and financed from its own vote. The largest of these is the National Physical Laboratory whose main function is research into methods of measurement upon which apparatus for research purposes and for the control of industrial processes must ultimately be based. The National Physical Laboratory has Divisions devoted to aerodynamics, electricity, engineering, light, mathematics, metallurgy, metrology, physics, radio, and ship-design.

The D.S.I.R. is also responsible for the Geological Survey of Great Britain and the Museum of Practical Geology. The work of the Survey covers the scientific study of the geology of this country. Its advice is in continual demand by Government and industry on such problems as the distribution of mineral deposits of all kinds and of underground water. The Survey is almost invariably consulted before any important civil engineering

work of any kind is begun. Other establishments of the Department deal with building; the prevention of fires; fuel, particularly coal, including the scientific survey of the national coal resources conducted at nine laboratories in the various coalfields, with headquarters at the Fuel Research Station at Greenwich; the utilisation of timber; road research; the treatment of water and trade effluents and the prevention of the attack on stored produce by insects. The transport and storage of foodstuffs are dealt with in three laboratories, *viz.* the Low Temperature Research Station, Cambridge; the Torry Research Station, Aberdeen, which is devoted to fish; and the Ditton Laboratory, East Malling, devoted to the large-scale storage of fruit. The D.S.I.R. also maintains a Chemical Research Laboratory.

Collaboration between D.S.I.R. and the executive departments of State has become steadily closer and the provision of scientific knowledge upon which policy can be based has assumed continually increasing importance. The task of carrying out research to provide this knowledge is largely that of the D.S.I.R. establishments which co-operate closely, for example, with the Ministry of Works on building research and the Ministry of Fuel and Power on fuel research.

Most of the Department's organisations are under separate Directors of Research who are in turn advised by Boards and Committees appointed by the Lord President and which, like the Advisory Council, are composed of independent scientists and industrialists with assessors appointed by the appropriate Government departments.

INDUSTRIAL RESEARCH. In meeting its second objective D.S.I.R. has encouraged industrial research in many ways, but the chief means adopted has been the institution of co-operative research associations. These are autonomous bodies formed to serve the needs of particular industries, financed by the industries themselves, but assisted by grants from the Department related in amount to the sums raised by industry.

There are at present Research Associations serving the following industries: Iron and steel; non-ferrous metals; cast iron; coal, gas and coke; electricity; cotton; silk; rayon; wool; linen; jute; leather; boots and shoes; cocoa; chocolate and confectionery; flour-milling; food-processing; motor industry; internal combustion engines; laundry; paint and varnish; pottery; refractories; scientific instruments; ship-building; printing and paper; rubber; welding; production engineering.

Negotiations are going on for the formation of several other associations.

RELATIONS WITH UNIVERSITIES

Turning to the relation of the Department to the universities, it should be noted that the responsibility for general provision for university research is not that of the Department but of the University Grants Committee. The Department, however, makes grants to individual workers at the universities and similar institutions. Such assistance normally takes the form of provision for the employment of research assistants or for the acquisition of special apparatus. The main criterion for the grants is the "timeliness and promise" of the work proposed. On the recommendation of its Boards and Committees the Department also makes arrangements for work on specific items to be carried out on their behalf extra-murally at the universities.

The D.S.I.R. is also brought into close contact with the universities in a scheme for maintenance allowances for post-graduate students, which allows them to be trained as research workers. Under this scheme young post-graduate students work under the direction of a supervisor for perhaps two years on a problem usually selected by him. The object is not to turn out specialists, but to turn out trainees with an understanding of the scientific method of attack and with the confidence necessary for successful research work.

INFORMATION AND INTELLIGENCE

Information in the possession of the Department and its advice have always been freely available to inquirers. To extend this service the headquarters of the Department have been strengthened by the setting up of an Intelligence Division, with the specific task of assisting inquirers with advice on the best means of dealing with their research problems. The object is not so much the provision of technical answers to inquiries, as the direction of inquirers to appropriate persons or organisations if reference to scientific literature is not sufficient. Thus the Division will direct inquirers to the establishments of the D.S.I.R., research associations, university workers or on occasion to industrial firms. In those cases where private consultants are able to be of assistance it will direct inquirers to suitable private consultants on the advice of the appropriate professional institutions. The Division also co-operates with other information and intelligence divisions set up by industries, chambers of commerce and other industrial organisations.

The Division is also responsible for the extension of the publicity services of the Department which, in addition to the publication and dissemination of scientific and technical knowledge, will include publicity of a more popular kind in the press and by broadcasts. A series of films and exhibitions are being planned.

OVERSEAS LIAISON

An Overseas Liaison Division has been set up, to which have been allocated various responsibilities in the field of scientific liaison with the Dominions and foreign countries, transferred to the Department on the ending of the wartime Ministry of Production. The Division is responsible for administration, on behalf of U.K. Departments, of the U.K. Scientific Mission in the British Commonwealth Scientific Office, North America, in Washington, and for similar Offices which it may be decided to set up from time to time, e.g. in London and elsewhere, as recommended by the Royal Society's and Official Scientific Conferences in 1946.

FUTURE PLANS

A survey by the Directors of Research and their respective Boards to consider how their work should be adapted and reorientated to meet post-war needs has been completed. Considerable expansion of the programmes of the Building, Fuel and Chemical Research Stations in particular is proposed. In 1946 a new division was established in conjunction with the Fire Offices' Committee for Fire Research, and a Fire Research Station is to be established as soon as possible.

Future plans also include the establishment of new stations for research in Mechanical Engineering, Hydraulics, and Radio.

RESEARCH ESTABLISHMENTS OF THE D.S.I.R.

Building Research Station

(Department of Scientific and Industrial Research)

Bucknalls Lane, Garston, Nr. Watford, Herts.

Telephone: Garston 2246.

Director : F. M. Lea, O.B.E., D.Sc., F.R.I.C.

THE Building Research Station was established in 1921. Its origin can be traced to the Housing (Building Construction) Committee (the Tudor Walters Committee) set up by the Local Government Board during the war of 1914-18 to consider problems of post-war housing. At the instance of that Committee, certain investigations on building materials were undertaken by the Department of Scientific and Industrial Research, who appointed for that purpose a Building Materials Research Committee. This Committee was disbanded in 1920, and following a suggestion from the Standardisation and New Methods of Construction Committee of the Ministry of Health, the Building Research Board was appointed in that year by the Department to put research on building materials and methods of construction on a wider and more permanent footing.

The Building Research Station was first established in temporary premises at East Acton, and was moved to its present quarters in 1925. The Station has a staff of 339 of whom 164 are scientific and technical. Its present annual expenditure is £240,000.

SCOPE OF INVESTIGATIONS

The work of the Station falls into the following main divisions : Problems of materials ; problems of the structure ; problems associated with the efficiency of the building as a whole ; and problems of the technique of construction.

Work on materials is largely of a chemical and physical nature and covers a variety of materials such as building stones, clay products, cement and concrete, renderings and plasters, and flooring and roofing materials. Work on problems of the structure is largely of an engineering nature and is concerned primarily with the strength and stability of structures and related matters, such as problems of foundations, the stability of embankments and cuttings, pile driving, stresses in structures, wind pressures and fire resistance. Work connected with the efficiency of the building in use is particularly concerned with problems of heating, lighting, ventilation, sound insulation and plumbing and includes, for example, investigations of the heat losses through different elements of the building structure, of the distribution of light in rooms as affected by orientation and fenestration, and of the degree of sound insulation provided by different forms of elements of structure. The study of the technique of building construction is undertaken with a view to the comparison of different types from the standpoint of ease and speed of erection and is concerned at the same time with the effect of modifications of technique.

For the purpose of its work the Station is able to take advantage of special facilities and experience possessed by other establishments of the Department. For instance, the experimental work on sound insulation and on

thermal conductivities of building materials is undertaken at the National Physical Laboratory; the Station co-operates with the Fuel Research Station on problems of heating; work on timber is undertaken at the Forest Products Research Laboratory.

SERVICES TO THE BUILDING INDUSTRY

The information and experience of the Station is held available in the fullest possible manner for the use of the building industry. The Station is prepared to answer inquiries on all problems of building, whether on troubles that have arisen in existing buildings, or on the design of projected buildings and structures. It has an extensive library, which is also held available for use and consultation, and for the preparation of bibliographies, etc. In general, these services are given without charge. It should be noted, however, that the Station does not engage to act in cases of dispute regarding problems of building leading to arbitration or legal proceedings.

In addition to the general research programme, which is undertaken in the public interest, and forms the main bulk of the research work of the Station, the following special arrangements are made for investigations which, in greater or less measure, are of special interest to professional institutions, associations or groups of firms, or individual firms.

CO-OPERATIVE RESEARCHES. Investigations of interest to particular sections of the industry may be undertaken in co-operation with a professional institution, with an association of firms or with a group of firms under arrangements by which the co-operating body makes an agreed contribution to the cost. The Station reserves the right to publish the results of such work, but does not do so without consultation with the co-operating body.

SPECIAL INVESTIGATIONS. Any individual firm may have an investigation made on its product, on payment, and receive a report which it is at liberty to publish in its trade literature, without further reference to the Station, or alternatively an approved abstract may be used by the firm in that manner. The Station again reserves the right to publish the results in so far as they are of general interest, but does not do so without first giving the firm an opportunity of expressing its views.

SPECIAL SERVICES

Much of the effort of the Station is at present concentrated on mobilising the available information for use in the planning of the post-war building programme and in general in giving technical advice in connection therewith. Three salient forms of activity in this connection are described below.

CODES OF PRACTICE. In certain cases before the war the Station produced Codes of Practice, but it has never regarded the preparation of Codes of Practice as being part of its normal work, considering that it was more of a function to be discharged by the professional institutions, but with the Station giving all the technical help and advice which it could. In 1942, the professional institutions established, under the leadership of the Ministry of Works, a Codes of Practice Committee, consisting of representatives of the Institutions sitting under a Chairman appointed by the Minister of Works, whose duty it is to arrange for the production of a comprehensive series of Codes of Practice, covering all aspects of buildings, civil engineering, and public works. The Station has undertaken to give every technical

assistance in this work and has taken an important part both in the general development of the scheme and in the preparation of individual codes, for which purpose technical officers of the Station sit with the Drafting Committees.

BRITISH STANDARD SPECIFICATIONS. For many years the Station has taken an active part in the preparation of British Standard Specifications dealing with building materials and elements of structure, and at present is heavily engaged on this in view of the desire of the Government for an extension of the range of British Standard Specifications in this field.

INTER-DEPARTMENTAL COMMITTEE ON HOUSE CONSTRUCTION. Officers of the Station sit with the inter-Departmental Committee on House Construction and assist by presenting reports assessing the technical merits of schemes submitted to the Committee and carrying out any tests that may be required.

DISSEMINATION OF RESULTS

The results of the Station's work are published in various ways. The following are issued through H.M. Stationery Office: *The Reports of the Building Research Board* (summaries of the Station's progress from year to year) published annually except in the years 1940—1944 inclusive, which are dealt with in retrospect in the Report for 1945; *Technical Papers*, which are essentially scientific accounts of researches on particular problems; *Special Reports*, in which groups of associated problems (such as studies in connection with a particular product) are dealt with in a comprehensive manner for the information, not only of the scientific worker, but also of the manufacturer or user; *Bulletins* (summaries of information on a selected topic, written, so far as is possible, in non-technical language); *Building Science Abstracts*, which comprise a selection of abstracts prepared from English and foreign periodicals containing information on building science, brought together and issued monthly.

The above are all priced publications. On occasion, unpriced leaflets are prepared and issued free by the Building Research Station to inquirers. For instance, a series of twenty-four leaflets have been published on different aspects of the general problem of the repair and restoration of bomb-damaged and neglected property.

Besides these publications the results of the Station's work are communicated in the following ways:

NOTES FROM THE INFORMATION BUREAU. Before the war the Station issued every month to some 30 trade and technical journals notes dealing either with questions that have been put to the Station from the industry or with selected topics.

PAPERS TO TECHNICAL AND SCIENTIFIC JOURNALS. From time to time papers by members of the staff are communicated for publication in technical and scientific journals.

BIBLIOGRAPHIES. A limited number of copies of bibliographies which have been prepared in the course of the Station's work are available on request.

EXHIBITIONS. In normal times the Station takes part in exhibitions held in this country such as the Building Trades Exhibitions. Travelling exhibits have also been arranged for demonstration at different centres, e.g., technical colleges, though it has not yet been possible to resume this activity fully since the war.

FILMS. In certain cases films have been prepared of different aspects of the Station's work which are available for issue on loan to outside bodies.

LECTURES. Lectures are given by members of the Station's staff to associations of professional men or firms in the industry as well as to groups interested in the general building problem. In suitable cases, special series of lectures can be arranged.

Chemical Research Laboratory

(*Department of Scientific and Industrial Research*)

Teddington, Middlesex.

Telephone : Molesey 1380.

Director : R. P. Linstead, C.B.E., D.Sc., F.R.I.C., F.R.S.

THE Chemical Research Laboratory was established in 1925. It grew out of work which had been in progress since 1915 under the direction of the Chemistry Co-ordinating Research Board. This had been carried out by different groups of workers dispersed in widely-separated laboratories. The establishment of the Laboratory near the National Physical Laboratory at Teddington brought these workers together and provided the organisation and stimulus which a co-ordinated programme of research required.

The work of the Laboratory is now conducted under the guidance of the Chemistry Research Board (Chairman: Professor W. N. Haworth, D.Sc., F.R.S.) and covers the following fields: Chemical researches for other stations of the Department and for other Government Departments; researches of a fundamental nature not otherwise provided for, including development work where necessary to demonstrate their industrial value; research of a fundamental or industrial nature at the request of industry and, where appropriate, with its financial support.

The scientific staff of the Laboratory is organised in five main sections while two smaller groups carry out exploratory work. An engineering section, with well-equipped workshops, designs and constructs much of the apparatus required by the research staff.

The five sections cover:

1. *Corrosion of Metals.* Investigation into the mechanism of corrosion under both immersed and atmospheric conditions. Much attention has been given to accelerated tests of corrosion and to protective coatings. Microbiological corrosion is also being studied.

2. *High Polymers and Plastics.* The Laboratory has always had an active interest in the development of plastics, particularly in regard to the mechanism of condensations and polymerisations. It has devoted much time to the better understanding of the structure of resins and the evaluation, in collaboration with the National Physical Laboratory, of their properties.

3. *Coal Tar.* Researches on coal tar have been pursued since the inception of the Laboratory, the chief objectives being: (1) Isolation of coal tar constituents in a pure state, (2) determination of the physical constants and chemical properties of the pure compounds, and (3) development of new uses for tar products. High efficiency fractionation is a feature of the work.

4. *Organic Intermediates.* The preparation of new intermediates and the development of new methods of preparation of known intermediates. The Laboratory took a leading part in the development of high pressure equipment and has studied intensively the condensation of hydrogen and carbon monoxide under pressure. The high pressure equipment of the Laboratory is a useful adjunct in the preparation of organic intermediates which include those that might be of value in the preparation of high polymers.

5. *Inorganic Chemistry.* Studies of lesser known metals, including their extraction and purification, are being carried out. The development of new techniques for analysis and purification is an important part of this work and a number of physical techniques are under investigation.

Although the accumulation of knowledge is the primary object of all the researches carried out by the Laboratory, the possible application of such knowledge to industrial problems is continually kept in mind, and assistance is rendered to industry by the teams which over many years have become expert in their own subjects. For example, the close study made of micro-organisms, in the Microbiology Section, enabled valuable contributions to be made to the problems of decay of fabrics and ropes, and of the corrosion of buried pipe lines, whilst the many years' study of the nature of corrosion, both immersed and atmospheric, of both ferrous and non-ferrous metals, led to important methods of protection of such metals.

On occasion, as for example in high pressure work, the equipment of the Laboratory is placed at the disposal of industrial concerns to carry out exploratory experiments and as a result the Laboratory has contributed to the development of new methods of manufacture. The results of the researches carried out at the Chemical Research Laboratory are made freely available to industry, for which purpose an Intelligence Section has recently been established. Publication in scientific journals ensures that such results are available to scientific workers throughout the world.

Fire Research Organisation

(Department of Scientific and Industrial Research and Fire Offices' Committee)

123, Victoria Street, S.W.1.

Telephone: Victoria 2493.

Director : S. H. Clarke

THE year 1946 saw an important step taken towards the co-ordination of fire research—the establishment of a joint organisation of the Department of Scientific and Industrial Research and the Fire Offices' Committee. A joint Fire Research Board has been appointed to advise on research into the prevention and extinction of fires, on the safety of life in fires, and on the mitigation of damage. A Fire Research Station will be established as soon as possible.

The programme of the Fire Research Organisation is only provisional and is subject to readjustment. At present it includes :

A survey of outbreaks of fires. All fires attended by the N.F.S. are reported in a standard manner and the reports are analysed statistically.

Fundamental studies of fire and fire suppression.

Studies of safety of life at fires ; means of escape.

Studies of the effects of fires in buildings and other structures and the improvement of structural fire precautions on economic lines. This work will include research using the equipment of the Fire Testing Station of the Fire Offices' Committee, which is to be part of the joint Research Organisation.

Studies of industrial and other special fire hazards.

The improvement of fire fighting appliances and technique.

Food Research Organisation

(Department of Scientific and Industrial Research)

Lloyds Bank Chambers, Hobson Street, Cambridge

Director : F. Kidd, D.Sc., F.R.S.

*Telephone :
Cambridge 55604.*

LOW TEMPERATURE RESEARCH STATION

Downing Street, Cambridge. Telephone : Cambridge 4477.

Superintendent : E. C. Bate-Smith, M.Sc., Ph.D.

TORRY RESEARCH STATION

Aberdeen. Telephone : Aberdeen 1269.

Superintendent : G. A. Reay, Ph.D.

DITTON LABORATORY

East Malling, Maidstone, Kent. Telephone : Aylesford 7256.

Superintendent : C. West, D.Sc.

THE Food Investigation Board of the Department of Scientific and Industrial Research was set up in 1917 "to investigate and control research into the preparation and preservation of food." The Food Investigation Organisation undertakes a broad programme of research on the properties and behaviour of foodstuffs, and on the scientific problems involved in their storage and transport. Its work covers the field of scientific investigation which lies between primary production on the one hand and nutrition on the other.

In the first years of the Board's activities work was carried out under its general direction in various university laboratories. Approval was given in 1920 for the erection of a laboratory specially equipped for research in the low temperature preservation of food, and by courtesy of the University of Cambridge, a site was placed at the Department's disposal for this purpose. Work in this Laboratory (the Low Temperature Research Station, Cambridge) commenced in 1922. The Department and the University are jointly represented on its Committee of Management. A considerable extension of the laboratory buildings was made in 1928, and some further additions in more recent years. The particular feature of the Laboratory is a series of constant temperature rooms, maintained at temperatures of from $+35^{\circ}$ to -35°C . ($+95^{\circ}$ to -31°F .); provision is also made, on a smaller scale, for obtaining temperatures down to -70°C . (-94°F .) and for work at controlled relative humidities and in atmospheres of different oxygen and carbon dioxide contents.

Sir William Bate Hardy, F.R.S., was the first Director of Food Investigation, and also Superintendent of the Low Temperature Research Station. The direction and emphasis of the work of the Laboratory owe much to

his guidance and leadership. A fundamental aspect has been insistence on the priority of the biological sciences in food research.

A problem which presented itself early was the devising of suitable methods for the storage of fruit, particularly in cases where the use of cold alone was not adequate. By suitably increasing the carbon dioxide content of the storage atmosphere, and reducing the oxygen content, it was found possible greatly to prolong the period of successful low temperature storage of apples and pears. The process was developed to a stage of full commercial applicability, and is now largely used by growers of apples and pears in this country to conserve a proportion of their fruit for marketing out of season. These growers' gas-stores now have a total capacity of over 4 million cubic feet, capable of storing over 30,000 tons of fruit.

The investigations had another important practical outcome, since it was shown that an excessive accumulation of carbon dioxide such as might occur in an insufficiently ventilated gas-tight chamber produced severe damage to the stored apples. It was later found that damage of this type was in fact already being encountered in imported cargoes of Australian apples, carried in more or less gas-tight spaces on board ship. The knowledge gained in laboratory investigations was confirmed by shipboard surveys, and provided the means for overcoming this difficulty of the import trade.

A further extension of the work on controlled atmosphere storage afforded a solution to the problem of bringing beef from the distant Dominions in chilled instead of in frozen form. It was found that in an atmosphere containing about 10 per cent. of carbon dioxide, the growth of bacteria and moulds on the surface of chilled beef could be retarded to such an extent that the possible storage "life" of the chilled beef was approximately doubled. Thus it became possible, by the use of specially-equipped spaces on board ship, to bring beef from Australia and New Zealand in the form which had previously only been possible for shorter voyages, such as that from Argentina.

Early work on the freezing of animal tissues led to the conclusions that quality in frozen meat and frozen fish would best be retained by rapid freezing and by lower temperatures of storage than were then current in practice in this country. In collaboration with the fishing industry studies were made of a full-scale plant for the freezing and storage of halibut on board ship.

It soon became evident that research on fish preservation was likely to demand facilities not easily provided at an inland laboratory, and in 1929 this part of the work was transferred to a new Laboratory (the Torry Research Station, Aberdeen). Here research has been pursued on all aspects of fish preservation, but with particular reference to freezing and smoke-curing. A marked improvement on traditional methods of smoking has been obtained by the use of a new type of kiln in which temperature, relative humidity, and smoke-content can be accurately controlled to give a uniform product of the desired character. The freezing of herrings—as a method of conserving seasonal surpluses—has been successfully demonstrated on a pilot-plant scale, and it has been shown that at sufficiently low, but quite practicable, temperatures, the product has a storage "life" of many months, whether for consumption as herrings, or for subsequent kippering. Much other work has been done to improve the handling of fish both at sea and after landing.

A third Food Investigation Laboratory (the Ditton Laboratory, East Malling, Kent) was opened in 1930, and has as its main function the investigation of the storage of fruits, on a larger scale than had been practicable at Cambridge. The Laboratory lies in the centre of the main fruit-producing county and has the added advantage of immediate proximity to the East Malling Horticultural Research Station, where work on fruit tree stocks is so largely centred. The equipment of the Ditton Laboratory includes a model refrigerated gas-store, and an experimental hold designed to investigate problems of temperature control, stowage and air movement in cargoes of fruit on board ship.

There are also two small laboratories in London, whose special function is to maintain close contact with practical problems in the day-to-day handling and marketing of fruit and of meat respectively. The fruit laboratory is situated in close proximity to Covent Garden Market, and the meat laboratory is adjacent to Smithfield Market.

The *Annual Reports* of the Food Investigation Board, published by H.M. Stationery Office, are intended to give, in summary form, a survey of the work in progress. Publication of the results of particular researches is made in scientific or technical journals, as appropriate. *Food Investigation Special Reports*, published by H.M. Stationery Office from time to time, are usually devoted to a review of some broad field of research. A certain number of leaflets, embodying technical data and practical advice, have also been issued. An important publication, which appears quarterly, is the *Index to the Literature of Food Investigation*, which is comprehensive in scope and contains brief references to published papers from the scientific literature of this and other countries. These official publications, with the exception of the *Index*, have been suspended, but it is expected that publication will be resumed shortly.

Forest Products Research Laboratory

(Department of Scientific and Industrial Research)

Princes Risborough, Aylesbury, Bucks. Telephone: Princes Risborough 101.
Director : F. Y. Henderson, D.Sc., D.R.I.C.

IN 1920, the Imperial Forestry Conference made a recommendation which led to the establishment by the British Government, under the Department of Scientific and Industrial Research, of a Forest Products Research Board. Its functions were the organisation and maintenance of research into the utilisation of timber and other forest products. Following a survey of circumstances and the needs of industry by the Board, the Government, in 1925, set up a Forest Products Research Laboratory. The personnel and equipment were at first accommodated, as a temporary expedient, in buildings at the Royal Aircraft Establishment, South Farnborough, Hants. By July 1927 a new laboratory had been built at Princes Risborough, to which the staff and equipment were transferred. Subsequently, with the aid of a grant from the Empire Marketing Board, it was possible to add to the accommodation and extend the activities of the Laboratory.

The various activities were organised under different Sections, the objects of which may be summarised briefly as follows :

WOOD STRUCTURE. To undertake investigations into the anatomical structure of wood in relation to its growth conditions and technical properties ; to make identifications of timbers and to maintain a collection of type specimens for research purposes.

PHYSICS. To study the movement of moisture and heat in wood and its elastic properties and machining qualities ; to devise new or improved testing methods ; and to relate the physical properties of wood to its composition and use.

SEASONING. To study the practice of air, kiln and other methods of seasoning, the design and operation of kilns, with a view to greater efficiency and reduction of waste, and the moisture relations of wood in use. Work on the steam-bending of wood was also undertaken in the Section, and at a later date it was extended to include an investigation of bends made from plywood and of laminated construction.

TIMBER MECHANICS. To determine from tests the comparative mechanical properties of various timbers, and the influence of defects on strength properties in timber in structural sizes ; to study the relation of mechanical properties to other characteristics ; and to devise special tests for specific uses. This phase of the work has for its objective the correct selection of species and quality of timber for specific uses and the economic design of structures. Later a study of the design of boxes, crates and packaging materials was undertaken with the object of providing the maximum of protection to goods in transit compatible with the economic use of wood and other packing materials.

COMPOSITE WOOD. To investigate problems associated with the cutting and drying of veneers and the manufacture of plywood and other composites containing wood as a major constituent, and the properties of adhesives employed in making composite wood under varying conditions of temperature and humidity, with a view to effecting improvements in technique.

WOODWORKING. To investigate the underlying principles of woodcutting and the behaviour, one by one, of commercial timbers at different moisture contents during various machining operations, with a view to improvement in the design of machines and tools in the interests of economy and increased efficiency ; to study problems arising in the cutting of refractory timbers and composite woods in relation to the design and metals of cutting tools.

WOOD PRESERVATION. To study the durability and resistance to fire of timbers in their natural and treated states, the treatment of timber to increase its resistance to decay and fire, the methods of impregnation with preservatives by species, and the relative toxicity of preservatives and efficacy of fire-retardant chemicals.

MYCOLOGY. To study the physiology of staining and wood-destroying fungi ; to determine the identity of species causing decay or discoloration in timber ; to make special studies of dry rot ; and, in co-operation with the Section of Wood Preservation, to study the toxicity of preservatives.

ENTOMOLOGY. To make biological studies of insects attacking timber, with a view to the development of methods of control ; to study, in co-operation with the Section of Wood Preservation, the toxicity of insecticides and preservatives.

CHEMISTRY. To study the chemical composition of wood, the properties of its components, and the chemical changes induced in wood by various agencies, with a view to improved utilisation through a better understanding of its chemical constitution and properties.

UTILISATION. To undertake industrial investigations into the uses of timbers, irrespective of origin, and of waste wood in the form of slabs and off-cuts, waste material from machining operations, etc. To study the production of charcoal in kilns and effective methods of utilising sawdust and other forms of waste wood as sources of energy.

PUBLICATIONS AND RECORDS. To collect and circulate information from scientific and technical publications having a direct or indirect bearing on any phase of the Laboratory's work ; to arrange for the publication, through the Department, of the various bulletins, handbooks, records and other literature prepared at the Laboratory ; and to maintain a library of works of reference, etc. The *Annual Reports* of the Forest Products Research Board summarise the work in progress, detailed results being given in the series of reports noted above. During the war most of these publications were suspended except for reports on subjects of wartime interest. The various forms of literature are published and (with the exception of free leaflets which are distributed by the Laboratory) sold by H.M. Stationery Office. In addition, contributions are made to scientific and technical journals.

EXTERNAL RELATIONS. To act as liaison agent between the Laboratory and industry ; to make the necessary arrangement for visits to the Laboratory by students and others seeking general information ; to arrange courses of instruction for and supervise the work of advanced students of wood technology ; and to organise exhibits or loan collections, as required, for educational purposes. The personnel of the Section, by visits to and discussions with members of the timber-using professions and trades, attempt to discover what problems are arising to the solution of which research might profitably be directed, and to give general assistance by making known information, based on past work, appropriate to their solution.

It is necessary to emphasise that the different Sections are not separate units acting independently one of the other, but are rather members of a team co-operating to achieve the general objects for which the Laboratory was established. A hint of the kind of joint work undertaken by various Sections has already been given, and in fact, any or all work together or independently as occasion demands.

An important feature of the Laboratory's work is its free advisory service, by means of which many thousands of requests for information have been met since it came into existence.

Fuel Research Station

(Department of Scientific and Industrial Research)

*Blackwall Lane, East Greenwich, London, S.E.10. Telephone: Greenwich 1220.
Director : A. Parker, C.B.E., D.Sc., F.R.I.C., M.I.Chem.E.*

THE Fuel Research organisation of the Department of Scientific and Industrial Research was formed in 1917 and comprises the Fuel Research Station at Greenwich and nine Coal Survey Laboratories in the various

coalfields of Great Britain. Its objectives are to investigate, in the broadest national interest, the nature, preparation, utilisation, and treatment of coal and other fuels and the products derived from them.

A comprehensive survey of the chemical and physical properties of the coals, as they are found underground, has been made. In addition, information has been obtained about commercial grades as produced at the collieries. The results have been published in more than 50 Coal Survey papers. In conjunction with the Geological Survey and with the co-operation of the Coal Commission, the Ministry of Fuel and Power and colliery undertakings, a rapid survey has been made of the quantities of coal and their types likely to be mined during the ensuing 100 years. A further study is in progress of the total reserves; this work will involve the making of borings in concealed areas and areas remote from existing collieries. The information obtained of the coals of the country enables coals to be correctly allocated for use in the best national interest, development work in mining to be properly planned and the fuel resources of the country to be developed as economically as possible and used with the highest efficiency that scientific knowledge, technical skill and organisation can achieve.

The production of coal for the market involves breaking, sizing, and cleaning. Experimental work, on various types of washers, including vacuum "froth flotation," has been carried out at the Fuel Research Station. The safe storage of coal to avoid combustion has been investigated and the requisite conditions established to reduce the risk of firing. Low-temperature carbonisation plants, which have reached a commercial scale in this country, have been tested by the Fuel Research Station staff and reports published. In addition, carbonising plant to produce a satisfactory low-temperature coke has been developed and a plant to this design has been erected by a commercial undertaking. Large-scale plants have been erected at the Fuel Research Station for carrying out experiments on the carbonisation of coal in horizontal and vertical retorts and in chamber ovens and for the production of water-gas and of hydrogen.

The conversion of coal into liquid fuel is of particular importance to this country, where there is very little indigenous oil. The primary work in this country on hydrogenation of coal and tar to oil as far as the semi-scale stage, was done at the Fuel Research Station. The synthesis of oils and methane from carbon monoxide and hydrogen has also been the subject of intensive work both in the laboratory and small plant stage. Investigations in Germany by members of the staff of the Fuel Research Station have provided full information on German technique and development.

Colloidal fuel (coal suspended in oil) has been the subject of large-scale trials. Burners of various types have also been devised for the use of pulverised fuel.

The efficient use of fuel is of vital importance to the community. On the domestic side, work is in progress in conjunction with the Ministries of Health, Works, and Fuel and Power. Various appliances, such as fires, stoves and cooking-ranges, have been tested. These tests involve special buildings and equipment. They form a useful basis in the development and use of efficient appliances. Measurements of smoke production are also made. The prevention of smoke from ships' boilers has received special study and a modified fire-door has been developed. This work is now being applied to land boilers.

Atmospheric pollution research comes under the Fuel Research organisation. The work involves the collection of measurements of atmospheric pollution throughout the country, and includes work on the prevention of pollution. Reports are regularly published of the data collected.

The Fuel Research organisation acts as adviser on fuel problems to the different Ministries of the Crown, and to the Dominions and Colonies. In the case of the Dominions and Colonies, training and experience are often given to members of their staffs, samples of fuels are analysed and tested, and advice given on proposed schemes of development.

Work is carried out for industries on particular problems. Investigations are in progress, for example, on the deposits on the heating surfaces of boilers and the sludging and corrosion in benzole absorption plants. Fundamental work is also carried out on such subjects as the constitution of coal, the synthesis of hydrocarbons, methods of coal and gas analysis. In conjunction with the Universities of Cambridge, Oxford, Manchester and Leeds special problems have been investigated. In some cases a member of the staff of the Fuel Research organisation is appointed to work under the guidance of the Professor or Head of the Department.

The Fuel Research organisation maintains close contact with the research work of other organisations including the National Coal Board, the British Coal Utilisation Research Association, the Gas Research Board, and the British Coke Research Association. A standing Consultative Conference on Fuel Research has been established to co-ordinate all work on fuel research. A Central Abstracting Bureau has been established at the Fuel Research Station for the preparation of Fuel Abstracts.

The following series of reports are published by H.M. Stationery Office : *Annual Reports of the Fuel Research Board, Technical Papers, Survey Papers, Reports on Low Temperature Carbonisation Processes, Special Reports and Miscellaneous Reports*; papers are also contributed to scientific and technical journals.

Pest Infestation Laboratory

(Department of Scientific and Industrial Research)

London Road, Slough, Bucks.

Director : G. V. B. Herford, M.Sc., O.B.E.

Telephone : Slough 21295.

THE Laboratory was started in 1940 as a result of co-operation between the Department of Scientific and Industrial Research and those sections of industry concerned with the handling of grain and grain products.

In 1937 an informal committee, representative of the different sections of the grain-handling industry, had met to express concern at the damage and loss caused by insect infestation and to ask for assistance in conducting an impartial inquiry into the conditions and the possibility of remedial measures. The D.S.I.R., as the appropriate department of Government, agreed to survey the state of infestation of stored grain and grain products throughout the United Kingdom. This survey the Department entrusted to the Imperial College of Science and Technology, to be undertaken by Professor Munro. The results of the survey were published in 1940.

Before the survey was complete, however, it became apparent that the serious nature of the problem had not been in any way exaggerated and, further, that much more information was needed concerning the rates of development and spread of infestation and the means of controlling it. Until such time, therefore, as the Department could set up its own permanent organisation, arrangements were made for work to be carried out in the Imperial College, under the advice and guidance of the Pest Infestation Research Committee, appointed for the purpose by the Lord President.

In 1940 the Department decided to set up a permanent organisation of its own to work on the problem of pest infestation, but at that time the erection of suitable buildings was out of the question, and the Imperial College generously placed at the disposal of the Department the greater part of the accommodation of its Biological Field Station at Slough. It must be mentioned that research on the infestation of stored produce had been proceeding in Professor Munro's Department of Entomology and Applied Zoology in the Imperial College since 1927, and the accumulated experience of some ten years was placed freely at the disposal of the newly-formed Laboratory.

It is important to realise that the Laboratory was primarily formed to deal with peacetime conditions, although, in fact, the whole of its activity so far has been directed to the solution of problems which arose or were intensified as a direct result of the war. Chief among these problems was the conservation of the security stocks of food, especially of grain and flour, which formed such a vital part of the nation's wartime economy. The prime responsibility for this work rested upon the Ministry of Food, which, early in the war, formed its own Infestation Branch. The Laboratory, as a wartime duty, undertook to assist this branch in all possible ways. With this object in view, its work fell naturally into two main sub-divisions—biological research and work on control methods—and the organisation was divided into appropriate sections, that section dealing with control methods being further split, for convenience, into two.

The biological work includes investigations into the life histories and behaviour of the insects and mites in relation to the conditions under which they live and their effect on the foodstuff attacked. This in turn has necessitated a study of the physical characteristics of bulk grain, the development of sampling technique and equipment and the devising of methods for estimating the intensity of the infestation of a given sample. A process for measuring the relative humidity in very small spaces has been evolved, and a machine for separating the wetter portions from a stream of grain has been designed and built.

The two sections concerned with control methods deal respectively with fumigants and with other insecticides such as sprays and dusts. The work on fumigants is very largely taken up with a study of the relation between the fumigant and the product; this includes measurement of penetration and sorption, development of analytical methods for estimating fumigants, etc. The scope of the work varies between microanalysis in the laboratory to the full-scale fumigation of silo bins. At the same time, work is in progress on the toxicity of fumigants to different insects.

Work on sprays and dusts has consisted largely of the development of testing methods and their use in selecting suitable insecticidal materials for use in the preservation of stored foodstuffs. Work is also in progress

on methods for prolonging the effective life of films of insecticides deposited on surfaces, *e.g.* on warehouse walls.

In addition to the work carried out on behalf of the Ministry of Food, the Laboratory made an intensive study of fly sprays for service use. The urgency of this work was due to the extreme scarcity of pyrethrum and certain other insecticides which had been largely produced in Japan or the East Indies.

During the war, most of the work of the Laboratory was limited to the solution of urgent practical problems and it has not been possible to carry out much of the longer-range work which, under normal circumstances, is necessary for a properly balanced research programme. This is being remedied as opportunity permits, and at the same time the Laboratory's field of action is being widened, to include, for instance, "domestic" insects, such as clothes' moths, cockroaches, ants and similar well-known pests.

Reports of investigations are published by H.M. Stationery Office and in the scientific and technical press.

Road Research Laboratory

(Department of Scientific and Industrial Research)

Harmondsworth, West Drayton, Middlesex. Telephone : Colnbrook 116.

Director : W. H. Glanville, C.B.E., D.Sc., Ph.D., M.Inst.C.E.

THE Road Research Laboratory is a Government organisation for studying problems that arise in designing, building and maintaining public highways. The primary objectives of this work, which is undertaken in close collaboration with the Ministry of Transport, are to improve the road as a channel for traffic, to reduce the overall costs of construction and maintenance and to promote safety and comfort in road travel. The principal subjects of study are : (i) Road design and layout, (ii) soils and aggregates, (iii) concrete roads, (iv) bituminous surfacings, (v) road surface characteristics, (vi) traffic flow and movement control, (vii) the use of machinery in road construction.

Advice on the conduct of the work is given by a Road Research Board under the chairmanship of Sir Frank Smith, G.C.B., G.B.E., D.Sc., LL.D., F.R.S., and by committees of the Board appointed to deal with specific subjects. Committees dealing with materials and methods of construction are the Committee on Soils, the Committee on Pavings and the Committee on Road Machinery. On the road safety side there are committees dealing respectively with Statistics, Roads (layout, surface characteristics, traffic signs, street lighting, etc.), Vehicles, and Road Users. The last-named is a joint committee of the Road Research Board and the Medical Research Council, the Council being responsible for researches into the physiological and psychological characteristics of road users.

Frequent contacts are maintained with industries concerned with the various aspects of the work, and certain parts of the programme are undertaken co-operatively with trade associations who contribute to the cost of the work and appoint representatives to joint advisory committees. Special investigations for which a fee is charged are undertaken on request in certain

cases. Investigations are also undertaken on allied problems such as those associated with the construction of aerodrome runways.

The Laboratory runs an extensive library and acts as a central pool of information on all matters relating to roads and road-building and on the civil engineering side of aerodrome construction. World literature is surveyed and indexed, and two journals of abstracts are published: *Road Abstracts*, prepared in collaboration with the Ministry of Transport (issued monthly by the Institution of Municipal and County Engineers), and *Aerodrome Abstracts*, in collaboration with the Air Ministry (issued every two months by the Institution of Civil Engineers). The library is available to road engineers and technicians by appointment and will answer bibliographic inquiries and issue publications on loan.

The results of the Laboratory's researches are published in official reports. Except for short *Wartime Road Notes* official publications were suspended during the war but will shortly be resumed in the form of *Technical Papers* and *Road Notes*; the publication of an *Annual Report* will also be resumed. Contributions are made to the proceedings of learned societies and to the technical press.

The Laboratory is represented on a large number of British Standards Institution and Codes of Practice committees. Instruction courses are held for road engineers. Advice and information are given on request.

Water Pollution Research Laboratory

(Department of Scientific and Industrial Research)

Langley Road, Watford, Herts.

Telephone : Watford 4477.

Director : B. A. Southgate, D.Sc., Ph.D., F.R.I.C., F.Inst.S.P.

THE Water Pollution Research Board is the successor to a long line of commissions of inquiry which had worked, particularly during the second half of the nineteenth century, to reduce the dangers and damage caused by the discharge of sewage and industrial liquors into underground waters and surface waters. With the growth of towns and the growth and concentration of industry in industrial districts, pollution of water by sewage had become widespread and there was a high death-rate from water-borne diseases. Moreover large quantities of water were necessary in many of the new industries which had been established and for this reason factories had been built on the banks of rivers in which the water was of suitable quality. Uncontrolled discharge of industrial effluents into rivers, however, had in many cases rendered them unsuitable for industrial use. One of the most famous of the various commissions which examined these problems was the Royal Commission on Sewage Disposal, which carried out experimental work and collected a large body of data. In their Final Report, published in 1915, this Commission pointed out that many further problems in the purification of polluting liquids remained to be solved and they recommended that a central authority should be set up to undertake this work.

The Water Pollution Research Board was appointed in 1927 to advise on the conduct of research on the prevention of pollution of waters, on the treatment of waters to improve their quality, and on related topics. In

carrying out this programme, the work of the Board has included investigations on : (1) Treatment of water ; (2) treatment of sewage ; (3) treatment of trade wastes ; and (4) the effects of pollution. At first the work was carried out at various places under a Director of Research. Later, in 1940, a special Laboratory for water pollution research was set up at Watford. It has now a total staff of about 50 which includes chemists, biologists, and bacteriologists.

Water for domestic use may require treatment to remove dangerous bacteria, to remove unpleasant tastes and odours, to improve its appearance, to prevent the deposition of excessive amounts of scale, or to render it non-corrosive to metals. Similar problems arise in the treatment of water for industrial purposes, for some of which water complying with very strict specifications is required. Investigations made by the Laboratory include work on the softening of water by exchange processes, on the treatment of corrosive water, on the bacteriology of lakes and streams, on the production of drinking water from sea water, on methods of prevention of deposition of iron, on the production of water of great clarity for underwater photography, on the effects of chlorine on corrosion of metal fittings, and on the treatment of boiler-feed water. Many of these investigations have been made at water works in collaboration with water engineers.

By the time the Royal Commission on Sewage Disposal was dissolved, in 1915, effective methods of treating sewage had been developed. Since that time, however, many improvements have been introduced which have led to economies in the cost of treatment and to improvement in the quality of the effluents produced. Work by the Water Pollution Research Laboratory, for example, has shown that by improved methods of operation the cost of treatment of sewage by one of the chief processes now used—that is by biological filtration—can be greatly reduced. Investigations have also been made, or are in progress, on the control of filter flies, on utilisation of sewage sludge, on the effects of chlorination of sewage effluents, and on the design of closets of the type which have been used in camps and A.R.P. shelters.

Treatment of waste waters from industry necessarily covers a very wide field since almost all industries discharge waste waters, the nature and composition of which differ widely. Before the war full-scale investigations had been made of methods of treatment and disposal of waste waters from the milk industry and from the manufacture of beet-sugar. In such investigations it is always necessary to consider very carefully the processes which give rise to the liquors since often it is possible to modify the manufacturing processes so as to reduce the volume and strength of the liquors ; the cost of plant for treatment may thus be greatly reduced. In the milk industry, for example, it was possible to reduce the volume of milk discharged in the waste waters, and in the manufacture of beet-sugar it has been found necessary and, it is believed, economic, to re-use a great proportion of the waste liquor in the factory processes. During the war many urgent problems in the treatment of trade effluents have arisen as a result of changes in the location of industries and of the setting up of new industries. The erection of flax factories in Great Britain, for example, introduced a serious problem of treatment of waste waters which was solved through development by the Laboratory of a new process of flax-retting from which no effluent was discharged. Other industrial wastes for which methods of treatment and

disposal have been developed during the war include those from shell-filling factories, from the pickling of copper, from photographic processes, from the manufacture of synthetic resins, from anodising and electro-plating, and from the drying of vegetables. More recently investigations have been undertaken on the disposal of waste waters from the manufacture of penicillin, D.D.T., and artificial silk, and from the processing of coffee and sisal. The last-mentioned research is being done in one of the Colonies and in this respect represents a new departure in the work of the Laboratory.

An important part of the work of the Laboratory is the assessment of the effects of pollution, particularly in surface waters. Two long researches had been made before the war, one on the River Tees, and the other on the estuary of the Mersey. Such surveys are very important since often the best means of treating industrial liquors can be devised only after careful consideration of the effects produced when the liquors are discharged to streams.

Another activity of the Laboratory is the collection of information on the field covered and the publication of monthly summaries of literature from British and foreign technical journals. From this accumulated store of information it is often possible to advise on specific problems without having to undertake special investigations. Where investigations are necessary they are usually made at first on a small scale in the Laboratory but are often followed by work with semi-scale or full-scale plant at factories, sewage-disposal works, or water works.

The progress of work in the Laboratory is summarised in the Annual Reports of the Water Pollution Research Board and technical papers are issued on certain of the investigations made. The Annual Reports were suspended during the war but publication is now being resumed and an account of work done during the war years will be published early in 1947. The Annual Reports, the technical papers, and the Summary of Current Literature are published by H.M. Stationery Office. In addition the results of researches are published in the scientific and technical press.

Geological Survey of Great Britain and Museum of Practical Geology

(Department of Scientific and Industrial Research)

*Exhibition Road, South Kensington, London, S.W.7. Tel : Kensington 5227.
Director : W. F. P. McIntock, D.Sc.*

THE Geological Survey of Great Britain, which is the oldest organisation of its kind, was established in 1835 under the control of the Board of Ordnance for the purpose of preparing copies of the Ordnance Survey maps "geologically coloured so as to be of service to science and industry." A Museum of Economic Geology designed to demonstrate the relation of geology and industry, was inaugurated in 1837. After various changes of title and authority the two institutions came in 1919 under the control of the Department of Scientific and Industrial Research, and in 1935 took up their present quarters. There are also an Edinburgh office (under the Assistant Director for Scotland) and district offices in Manchester and Newcastle-upon-Tyne.

Four Acts of Parliament give statutory powers for the prosecution of the work of the Geological Survey: An Act to facilitate the Completion of a Geological Survey of Great Britain and Ireland, Cap. LXIII, 1845 (concerning access to land); the Petroleum Production Act 1918; the Mining Industry Act 1926, Section 23; and the Water Act 1945 (concerning notification of projected borings and shafts for oil, minerals and water, and access to plans, records, specimens and mine workings).

THE SURVEY: MAPS AND PUBLICATIONS

The prime function of the Geological Survey remains that for which it was originally founded, *viz.*, the preparation of maps of Britain showing the distribution of rock formations and of mineral resources. These maps are based on the topographical maps prepared by the Ordnance Survey. In the earlier years of the Survey the mapping was done on the scale of 1-inch-to-1-mile, but subsequently a more detailed survey on the 6 inches to 1 mile was begun and is still in progress. Priority in the surveying programme has been given to the coalfields and other areas of economic importance. The 6-inch maps of the more important areas, including the coalfields and the London district, are printed and published; the remainder are available for reference and copies can be supplied. There are two series of 1 inch to 1 mile maps—the “Old Series” which covers practically the whole of Britain, and the “New Series.” Of the 360 sheets of the latter just over half have so far been completed; nearly all of them are based on detailed 6-inch field mapping, and are published colour-printed. Colour-printed maps on the 4-miles-to-1-inch and smaller scales, and special maps showing the distribution of mineral resources, are also published.

To supplement the Survey maps several series of descriptive memoirs, reports and handbooks have been prepared. These include 1-inch *Sheet Memoirs*, *District Memoirs* dealing with selected areas, and memoirs dealing specially with mineral resources and water supply. During the war publication was in the form of a series of *Wartime Pamphlets*. In addition to this published material the files and manuscript records of the Survey contain much important unpublished information.

As the technique of geological surveying becomes refined, and in particular as knowledge is augmented by new shafts, borings and excavations, revision of many of the older maps and memoirs becomes necessary and is carried on concurrently with the primary 6-inch mapping programme.

THE MUSEUM: EXHIBITS AND COLLECTIONS

The exhibits in the Museum of Practical Geology demonstrate the basic principles of geology and physical geography; the geology of Great Britain, with emphasis on the work of the Geological Survey, and its economic significance; and the economic mineralogy and geology of the world. Handbooks and guides to the exhibits are published, and public lectures and demonstrations are given. Before the war the annual number of visitors was about 300,000. Apart from the exhibited material the Museum is the repository of extensive reference and reserve collections. These include over 500,000 fossils, 100,000 rock specimens, 70,000 microscope sections of rocks, and 40,000 mineral specimens, and are widely consulted by research workers. The Geological Survey and Museum Library includes approximately 75,000 books and pamphlets, and 25,000 geological maps. The

Photographic Department has assembled some 13,000 photographs illustrating British geology and can supply prints and lantern slides of these.

The Museum is open to the public from 10.00 a.m. to 6.00 p.m. on weekdays, and from 2.30 p.m. to 6.00 p.m. on Sundays. The Library is open between 10.00 a.m. and 5.00 p.m. from Monday to Friday, and between 10.00 a.m. and 1.00 p.m. on Saturday.

LIAISON WITH INDUSTRY

Adequate geological information is essential to the mining and quarrying industries for the efficient exploitation of such materials as coal, petroleum, metallic and non-metallic ores, building-stone, slate, brick-clays, refractory materials, moulding sands, roadstone, limestone and gypsum; to the engineer, in connection with underground water supplies, drainage schemes, dam construction, foundations, aerodrome sites, tunnels, cuttings and other excavations; to agriculturists; and to planning authorities.

The resources of the Geological Survey and Museum are freely available to inquirers on such topics. Special field investigations additional to the normal programme of surveying are not normally undertaken, but all queries are dealt with which can be answered from recorded information or from the personal knowledge of the staff.

To further the practical application of geology, the Geological Survey and Museum acts in close co-operation with such bodies as the Soil Survey, the British Standards Institution, the National Coal Board and many of the professional institutions concerned with mining, quarrying and engineering. It maintains liaison with other branches of the D.S.I.R. working on cognate subjects, such as the Fuel, Road, Building, and Water Pollution Research Stations, and acts in an advisory capacity for Government departments including the Ministries of Health (for water supplies), Fuel and Power, Town and Country Planning, Works, and Transport.

National Physical Laboratory

(Department of Scientific and Industrial Research)

Teddington, Middlesex.

Telephone: Molesey 1380.

Director: Sir Charles G. Darwin, K.B.E., Sc.D., F.R.S.

THE urgent need for a central scientific establishment in this country led H.M. Treasury in 1897 to appoint a committee, under the chairmanship of the late Lord Rayleigh, to consider and report on the desirability of the project. The recommendations of the committee were accepted and the Royal Society was invited to carry them into effect. A scheme of organisation agreed between H.M. Treasury and the Royal Society was drawn up in 1899 and resulted in the foundation in 1900 of the National Physical Laboratory at Teddington, Middlesex, in Bushy House, an old Royal residence, which was granted by the Crown for the purpose.

Until 1918 the Laboratory was under the control of the Royal Society who appointed a general Board and Executive Committee to manage its affairs. In April 1918, the Government undertook full financial responsibility for the Laboratory, and it became a part of the newly-constituted Department of Scientific and Industrial Research. The Royal Society, by

agreement with the Department, has continued, up to the present time, to manage and advise on the work from its scientific aspect and the President of the Royal Society is, *ex-officio*, Chairman of the General Board. The Executive Committee consists of representatives of the Royal Society and of the principal technical societies and institutions whose interests lie in the same field as the work of the Laboratory. The Committee is so constituted as to ensure that both pure science and applied science are represented in considering their application to British industry.

The first Director of the Laboratory was the late Sir Richard Glazebrook, K.C.B., K.C.V.O., F.R.S. During the 19 years of his Directorship the Laboratory was continuously expanding and on his retirement in 1919 the broad essentials of the present organisation had been evolved. He was followed by Sir Joseph Petavel, K.B.E., F.R.S., 1919-1936, and by Professor Sir Lawrence Bragg, O.B.E., F.R.S. The present Director, Sir Charles G. Darwin, K.B.E., Sc.D., F.R.S., assumed office in December 1938.

The purposes for which the Laboratory was founded and which it continues to fulfil, are to carry out research, including especially research for the accurate determination of physical constants; to establish and maintain precise standards of measurement; and to make tests of instruments and materials. It also investigates special problems on behalf of Government departments, research associations, technical institutions, industrial firms, and others. Payment is received for the work done for outside bodies. The fees for the normal testing work are given in a series of pamphlets, which may be obtained from the Director on application. The charges for special investigations are based on the time occupied in the work.

The Laboratory, as at present organised, comprises ten main scientific Divisions, each under a Superintendent. These are as follows: Aerodynamics; Electricity; Engineering; Light (Optics and Photometry); Mathematics; Metallurgy; Metrology (including Control Mechanisms); Physics (Heat, Sound, Radiology); Radio; Ship.

The names of the Divisions indicate the wide range of physical research covered at the Laboratory. With few exceptions, tests of all classes of measuring instruments are undertaken. The special investigations made for firms and other bodies are of a varied character, and the experimental work required is normally carried out at the Laboratory, but members of the staff are prepared to attend at manufacturers' works to survey the problems and, if necessary, to carry out the investigation under service conditions. Also the reverse is possible; arrangements may be made in special circumstances for firms' representatives to work in the Laboratory on specific problems, in co-operation with the Laboratory staff.

The results of Laboratory researches are published in the proceedings of scientific societies or in the technical journals. An *Annual Report* is issued on the work of the establishment and a collection of abstracts of all the papers contributed to the scientific and technical press is published annually.* Lists of titles of current papers are issued from the Laboratory periodically and these lists can be supplied regularly, without charge, on application to the Director.

The results of a series of tests or a special investigation undertaken for a firm on repayment are given in a report which is confidential to the firm

* Under peacetime conditions, the list may be obtained from H.M. Stationery Office. The *Annual Reports* and lists of abstracts have not been issued during the war.

concerned. Where the investigation concerns a problem of general application and interest, the work may be undertaken at a reduced charge on condition that the Laboratory retains the right to publish an account of it in the appropriate technical journal at a later date.

The trend of development and research at the Laboratory is largely dependent upon industrial requirements as revealed by its contacts with industry. Such contacts arise mainly from inquiries on industrial problems and the Laboratory is always ready to give careful consideration to any problems or difficulties submitted to it, and to undertake experiments when it is thought that with the facilities available, a solution might be found. The charges are normally based on the time occupied in the ensuing experimental work but it sometimes happens that the information needed for a particular problem is already available. In such cases it may be possible for the staff of the Laboratory to advise effectively without recourse to experiment and thus to render assistance without cost to the inquirer. The closest contact should, therefore, be maintained between industry and the Laboratory for their mutual benefit and it is hoped that the fullest use of the facilities of the National Physical Laboratory will be made by firms and manufacturers seeking assistance in their research, development or production problems.

Admiralty : Royal Naval Scientific Service (R.N.S.S.)

The Admiralty, Fanum House, Leicester Square, London, W.C.2.

Telephone : Whitehall 7888.

*Chief of the Royal Naval Scientific Service : Sir Charles S. Wright, K.C.B.,
O.B.E., M.C., M.A.*

THE Royal Naval Scientific Service was instituted in 1944 as one of the steps to ensure the permanent provision for the Navy of the service which it needs in the fields of research, experimental design and development. Broadly speaking, this has meant the reorganisation and aggregation of the personnel hitherto enrolled in the Admiralty Scientific, Technical and Chemical Pools into one service.

The headquarters of the Chief of the R.N.S.S. is at the Admiralty, and contains four Research Departments headed by the Director of Physical Research, the Director of Aeronautical and Engineering Research, the Director of Research Programmes and Planning and the Director of Operational Research respectively. Each of the various Admiralty scientific and technical establishments has its team of scientists and engineers, usually headed by a Superintending Scientist who is a member of the R.N.S.S. One of the intended features of the organisation is that as a rule officers of the R.N.S.S. should have training and experience at sea, and that during such time they should wear the uniform of their equivalent naval rank.

ADMIRALTY SIGNAL ESTABLISHMENT

The Admiralty Signal Establishment has its headquarters at Haslemere and laboratories, workshops and testing sites in various parts of the country.

This establishment deals with research, development and production of radio for use in the Royal Navy, and is staffed by both naval and civilian personnel.

Board of Trade

Millbank, London, S.W.1.

Telephone : Whitehall 5140.

President : The Right Hon. Sir Stafford Cripps, K.C., M.P.

THE Board of Trade is not itself directly responsible for the conduct of industrial research, but is interested in the application of research in industry as a feature of the general responsibility which the Department has for industrial matters. In this connection, the Board of Trade works in close association with the Department of Scientific and Industrial Research, and other departments concerned.

PATENT OFFICE AND INDUSTRIAL PROPERTY DEPARTMENT

25, Southampton Buildings, London, W.C.2.

Telephone : Holborn 8721.

Comptroller-General : Sir Harold Saunders

THE Patent Office and Industrial Property Department deals with all questions relating to patents, designs, trade marks, and copyright, including the administration of the Patents and Designs Acts 1907—1946, and the Trade Marks Act 1938. It also deals with all branches of industrial literary and artistic property from the point of view of commercial and industrial policy, including both the encouragement of invention and the protection of the commercial public from the abuse of monopoly. It advises on international questions relating to the rights in foreign countries of British traders in respect of industrial, literary and artistic property. For these purposes, the Department is in close touch with the other departments of the Board of Trade interested in such matters.

The Patent Office Library, which is open to the public, contains English and foreign patent specifications (including printed copies of all English specifications published since 1617) and scientific text-books and periodicals. Two weekly publications are issued by the Patent Office, *viz.*, the *Official Journal of Patents* and the *Trade Marks Journal*, as well as the printed specification of patents, classified abridgments of specifications, and reports of patents, designs and trade mark law cases.

National Institute of Agricultural Engineering

(Ministry of Agriculture and Fisheries)

Askham Bryan, York.

Telephone : York 6421.

Director : W. H. Cashmore, B.A., N.D.A.

THE National Institute of Agricultural Engineering is a branch of the Ministry of Agriculture and Fisheries, and works under the technical guidance of the Agricultural Machinery Development Board. The general terms of reference are to foster mechanisation, to reduce the labour requirements of farming, and to increase the operating efficiency of machines.

One of the chief functions of the N.I.A.E. is to undertake developmental work either on its own account or in co-operation with manufacturers. The range of agricultural engineering is so wide that N.I.A.E. developmental work must necessarily be confined, at any one time, to a limited range of problems. Subjects of present development are machinery for harvesting, handling, and drying grain; a complete sugar-beet harvester; a potato harvester; and a harvester capable of handling all common root crops. The immediate aim of the work is to bring mechanisation to the aid of farmers who, with acute labour shortages, are nevertheless required to obtain increased production. It is hoped by a process of improvement and fundamental research on machines, mechanisms, and methods to obtain for the majority of farms a uniform level of mechanisation for all crops.

Another function of the N.I.A.E. is to foster in agricultural engineering that tradition of testing which is the root of development and progress in other branches of engineering. The testing services of the Institute offer two kinds of test, commercial and confidential, and an expression of opinion. Commercial tests are for machines that are in or ready for production, and the results can be made public by the entrants. The confidential tests are for machines or components that are still under development by the manufacturers, and the results are confidential to the entrants. Expressions of opinion are given when examinations are required in circumstances or seasons that make proper tests impossible; the results are confidential to the applicants. Copies of the regulations governing the tests may be obtained from the Director.

Ministry of Food

Montagu House, Whitehall, London, S.W.1. Telephone : Whitehall 4363.
Minister : The Right Hon. John Strachey, M.P.

INFESTATION DIVISION

THE Infestation Division of the Ministry of Food, working in close co-operation with the Ministries of Agriculture and Fisheries, and of Health, is generally responsible for the control of rats, mice, insects, mites, moulds, etc., which attack human and animal foods and certain other susceptible commodities at all stages of transport, manufacture, storage and distribution.

The Division operates under wartime powers, *i.e.* the Infestation Order, S. R. & O. 1943, No. 680, as amended by S. R. & O. 1945, No. 847. It also administers the permanent legislation of the Rats and Mice (Destruction) Act 1919, except so far as agricultural properties and Port Health Districts are concerned.

The Director of Infestation Control, assisted by a Deputy Director and two Assistant Directors, is responsible to the Minister for the organisation and working of the Division.

RAT CONTROL. Under the Infestation Order, duties, in addition to those under the Rats and Mice (Destruction) Act, are laid upon local authorities, who are directed and advised as necessary on the execution of plans for rodent eradication on comprehensive lines. To maintain the necessary supervision there is a Divisional Rodent Officer, with a staff of Inspectors, attached to each Food Division.

INSECT CONTROL. The country is divided into seven regions based on the principal ports. In each region there is a scientific inspectorate under a Senior Inspector (a trained zoologist or entomologist) and a separate commercial "action" organisation under a Port Area Representative. It is the function of the inspectorate to discover and assess infestation and advise on treatment, and it is the duty of the "action" organisation to carry out the necessary treatment where undertaken by the Ministry. For this purpose the Ministry maintains a large stock of equipment and materials.

RESPONSIBILITY OF OWNERS AND OCCUPIERS. Owners of commodities and occupiers of property are under duty to comply with requirements for remedying infestation. (In this connection the Division takes all necessary action for control of infestation in Ministry property).

GENERAL. All the work of the Division is co-ordinated and supervised at headquarters by the administrative and technical staffs. Advice on control measures is provided in the first instance by the Agricultural Research Council (rodents) and the Department of Scientific and Industrial Research (insects), and "development" research, preparatory to the inclusion of new methods in the routine of the Division, is undertaken by the Technical Officers of the Division.

Education in new methods is a special feature of the work of the Division, and technical staff is available to cover this requirement. The Headquarters technical staff includes: Two Senior Technical Officers and 16 Technical Officers on rodent control work; a Chief Chemist, whose primary responsibility it is to deal with the adequacy and safety of insect control measures; a Chief Entomologist, with general oversight of the entomological work; and an Architect and Surveyor to deal with matters of construction.

DEHYDRATION DIVISION

At the request of the Lord President of the Council, the Minister of Food undertook in 1942 the responsibility for the development of the dehydration of foodstuffs in the wider sense of the term and the Dehydration Division was made responsible for the duties involved. These duties included the co-ordination within the Ministry of all activities connected with dehydration and in addition the correlation of the requirements of other Departments with the sources of supply, both at home and overseas.

Standard plants were designed by the Ministry in collaboration with the Low Temperature Research Station of the Department of Scientific and Industrial Research and were installed by the Ministry in suitable factories. A few other firms who had suitable plant and equipment came into the scheme. The main vegetables dehydrated were potatoes, carrots, and cabbage, with some turnips and peas, and the total output of these factories was taken over by the Ministry for supply to the Services.

Since the termination of Services' contracts, production on Ministry account has ceased and plants installed by the Ministry in various firms are in process of being dismantled and sold. Production on a limited scale is being continued on private account by a few firms.

The Division acts as the procurement agency for the requirements of the Control Commission for Germany and negotiates the sale of dehydrated vegetables and soup from the Union of South Africa and the Commonwealth of Australia to the Commission and Relief Agencies.

The Division continues to maintain contact on technical developments at home and overseas and publications on such developments are distributed for information to the Dominions, Colonies and the Government of the U.S.A.

Ministry of Labour

8, St. James's Square, London, S.W.1.

Telephone : Whitehall 6200.

Minister : The Right Hon. G. A. Isaacs, M.P.

THE TECHNICAL AND SCIENTIFIC REGISTER

York House, Kingsway, London, W.C.2.

THE present Technical and Scientific Register, which is centralised at the London Headquarters of the Appointments Department, was formed in March 1942 from the Central Register set up in September 1938, and contains particulars of enrolled persons with technical and scientific qualifications such as engineers, chemists and metallurgists, physicists and mathematicians, biologists and other scientists, architects and surveyors, etc.

The minimum qualification accepted for enrolment on the Register is, in general, a university degree in science or technology or its equivalent, although there have been certain modifications, notably in the case of engineers, to meet special needs. The Technical and Scientific Register is assisted in its work by an Inter-Departmental Technical Personnel Committee, which includes the Chairman of Advisory Committees appointed for each of the main scientific and technological professions.

Ministry of Supply

Shell Mex House, London, W.C.2.

Telephone : Gerrard 6933.

Minister : The Right Hon. John Wilmot, J.P., M.P.

THE present Ministry of Supply is an amalgamation of the two Ministries originally set up to produce materials of war, the (former) Ministry of Supply and the Ministry of Aircraft Production. The Ministry is responsible for the provision of supplies to the Service Departments and the Ministry of Civil Aviation ; for research, design and development in connection with such supplies ; and for research into and development of atomic energy. It has prime responsibility for the engineering industry and the metal industries.

The scientific organisation of the Ministry is the largest in the country. It consists of three large groups dealing particularly with armaments, aircraft and atomic energy. The present scientific staff of over 4,000 represents about 7 per cent. of the country's scientific manpower. These scientists work mainly in the research establishments maintained by the Ministry throughout the country.

THE ROYAL AIRCRAFT ESTABLISHMENT at Farnborough is the centre of scientific research and experimental development in aeronautics. It acts as general adviser to the industry and the Service on aircraft and aircraft

engine design problems. Aerodynamics, power plants, aircraft structures, and materials are some of the main fields covered. The R.A.E. also designs essential equipment, e.g. autopilots, navigational instruments, oxygen equipment, cameras, electrical equipment, radio and radar communication equipment, etc.

AERONAUTICAL RESEARCH STATION. This research station at Bedford has been designed to provide the vastly increased research facilities essential to the successful solution of the problems of high speed and low drag. Such facilities will include test beds for the new engines, large wind tunnels and new structural apparatus.

THE TELECOMMUNICATIONS RESEARCH ESTABLISHMENT, at Malvern, studies the application of radio and radar technique on civil and military problems.

Other Research Establishments include: Marine Aircraft and Experimental Establishment; Aeroplane and Armament Experimental Establishment; National Gas Turbine Establishment; Chemical Defence Experimental Station; and the Atomic Research and Development Station.

Agricultural Research Council

*6a, Dean's Yard, Westminster, London, S.W.1. Telephone : Abbey 1177.
Chairman : The Right Hon. The Earl de la Warr, P.C., J.P.*

THE Agricultural Research Council is responsible to the Committee of the Privy Council for the Organisation and Development of Agricultural Research. There are not less than 12 and not more than 15 members, of whom not less than four nor more than five are appointed on account of their general experience of and interest in agriculture, while the rest are scientists appointed after consultation with the President of the Royal Society. Regard is to be had to the desirability of securing, as far as possible, that one member shall also be a member of the Medical Research Council and one a member of the Advisory Council for Scientific and Industrial Research.

The Council's duties include the giving of advice on agricultural research to the agricultural departments, *i.e.*, the bodies responsible (with Treasury authority) for the expenditure of money on agricultural research in Great Britain. Money is also placed at the disposal of the Council, by Parliament, to be expended on its own authority for the encouragement of agricultural research; and the Council is authorised to accept, hold and dispose of money or land for that purpose.

The establishment of the Agricultural Research Council completed the scientific organisation for the promotion and co-ordination of research on a wide range of problems that affect the life and activities of the nation as a whole. Consequently it has close relations with the other organisations established for this purpose under the Lord President of the Council, *i.e.*, the Medical Research Council and the Department of Scientific and Industrial Research, all three working for the close co-ordination of their respective fields of scientific research in the national interest.

The Agricultural Research Council examines and advises the departments of agriculture on the applications for research grants and programmes of

the existing research organisations. It co-ordinates agricultural research in the country as a whole. It has close relations with other Government departments, such as the Ministries of Food and Health and the Colonial Office.

The Council also initiates schemes of research, and it maintains a field station at Compton, Berkshire, especially equipped for isolation experiments on a considerable scale, for the study of animal diseases. In addition, the Council has under its direct control three Research Units concerned respectively with Animal Physiology, Insect Physiology and Soil Metabolism, and it has recently established an Organisation for Research on Animal Breeding and Genetics. The Council also employs a certain number of research officers stationed at suitable centres for specific work. The first part of the Council's work consisted in a comprehensive survey of the agricultural research being carried out in Great Britain, and reports were issued biennially up to the outbreak of war.

A summary of agricultural research in Great Britain was published in 1943.

British Broadcasting Corporation (B.B.C.) (Engineering Research Department)

42—44, Nightingale Square, Balham, London, S.W.12. Tel. : Battersea 8500.
Bagley Croft, Hinksey Hill, Oxford. Tel. : Oxford 85411.

Chief Engineer : H. Bishop

THE general function of the Research Department of the B.B.C. is to carry out not so much pure research as applied research, and to provide data for other branches of the Engineering Division. It operates in two ways : (a) It has problems put to it by other departments or by the Chief Engineer ; and (b) it may make proposals as a result of study or experimental work for the improvement of the service in some way or other.

The Department, of which H. L. Kirke is the Head, is divided into a number of sections which are listed and described below. The divisions are not rigid, and close co-operation exists between the sections. For example, portions of two or more sections may go into temporary partnership on a particular piece of work, and each section acts in an advisory capacity in its special line to the other sections. Interchange of engineers between sections is encouraged, in particular amongst the junior ranks, so as to widen their scope.

The present establishment of the Department includes qualified engineers, technical assistants, experimental mechanics, draughtsmen, an experimental workshop, clerks, stenographers, etc. The ratio of qualified engineers to technical assistants to all others is at present 1 : 0.5 : 2.

The following is a list of the specialised sections and their work :

RADIO FREQUENCY (TRANSMITTERS AND AERIALS). This section is responsible for research and experimental work connected with the principles, design or operation of broadcast transmitters. It is not normally the function of the Research Department to design transmitters, except in special circumstances, but to be informed in regard to all the data available and to provide new data where such is necessary. The section concerns

itself with new methods and systems and has, for example, carried out experiments on frequency modulation in order to determine its value in broadcasting. The section is also responsible for carrying out research and experimental work on all forms of aerials and transmission lines. It is responsible for the provision of data for the design of aerials for the medium wave and short wave broadcasting stations. It co-operates with other sections and with other departments of the Corporation in any special tests or investigations which may be required at transmitting stations.

RECEIVERS AND RADIO FREQUENCY MEASUREMENTS. The work of this section consists on the one hand of keeping up to date in general broadcast receiver design, and carrying out tests on typical commercially-produced receivers, carrying out experimental work in connection with receivers and reception, and where necessary designing receivers for special purposes. It has also been responsible, particularly during the war, for some work connected with the design of very wide band iron-cored radio receiver transformers, which have had a number of applications during the war, and are now finding applications in peacetime. A further aspect of the work is the development and design of radio frequency measuring apparatus for use by the section itself, by other sections, and other departments of the Engineering Division. Descriptions of some of the impedance-measuring apparatus were given in the Institution of Electrical Engineers Radio Section Chairman's Address, 1944, and published in the I.E.E. Journal.

FIELD STRENGTH MEASUREMENTS, PROPAGATION, ETC. The chief work of this section is in connection with the performance of transmitters in terms of their field strength polar diagrams. It is responsible for the measurement of the field strength of all the B.B.C. transmitters which are in operation, for carrying out preliminary measurements on proposed sites for new transmitters, in order to determine the suitability of such sites, and carrying out research and experimental work in general connected with the propagation of waves. It is responsible for the production of service area maps and data in connection with the preparation of new distribution schemes and any proposed changes in distribution. There is considerable co-operation between this section of the Research Department and the Department of Scientific and Industrial Research in connection with propagation. Much of the work done is a co-operative effort between the two establishments. Liaison is also maintained with other bodies interested in propagation work, such, for example, as Service establishments, the Universities, and Ministries.

ELECTRO-ACOUSTICS. This section comprises three sub-sections, namely Recording, Audio Frequency, and Acoustics. The work of these sections necessarily overlaps to a considerable extent and by combining them into a single electro-acoustics group it has been found possible to eliminate duplication of effort.

RECORDING. This section is responsible for research into all forms of sound recording. In certain cases it has been necessary for the section to carry out design work where it has not been possible to purchase suitable commercial apparatus. As part of its work it has recently completed the research and development work connected with a complete disc recording

machine, the first model of which has satisfactorily completed twelve months service trial. The section is responsible for assisting the appropriate operating Department in overcoming difficulties, and for liaison with firms and other bodies doing similar work.

AUDIO FREQUENCY. This section is responsible for experimental and research work in connection with audio frequency equipment, measuring apparatus, devices for performing special functions, such as, for example, automatic volume control, and for general research work in connection with sound as applied to broadcasting. The section is also responsible for research work and, where necessary, the development and design work in connection with microphones and loudspeakers. Very little is done on the design of loudspeakers, but it is the responsibility of the section to be informed of the latest practice, and to carry out measurements and tests on various types of commercially produced loudspeakers. This work has involved the development of various testing and measurement methods.

ACOUSTICS. The responsibility for all the experimental work connected with the design of studios rests with this section. The work involves the development of special methods of measurement and the analysis of such methods, as well as liaison with other interested bodies.

TELEVISION. This section, which had been constituted before the war, has now resumed its activities and been enlarged. The function of this section is to carry out research work in connection with all the aspects of television engineering which are of importance in broadcasting. It maintains a close liaison with the operational activities at Alexandra Palace and keeps in close touch with other scientific organisations concerned with the many problems in telecommunication engineering which arise in television technique.

Council of Industrial Design

*Tilbury House, Petty France, London, S.W.1 Telephone : Whitehall 6322.
Chairman : Sir Thomas Barlow, K.B.E.*

THE Council of Industrial Design was set up in December 1944 by the President of the Board of Trade. A Scottish Committee of the Council was set up at the same time under the Chairmanship of Sir A. Steven Bilsland, Bt., M.C., D.L., J.P.

The Council is financed by the Government, and a contribution from the Exchequer is made to Design Centres set up by industry in collaboration with the Council. Its purpose is to promote by all practicable means the improvement of design in the products of British industry. Its main functions are : To encourage and assist in the establishment and conduct of Design Centres by industries, and to advise the Board of Trade on the grant of financial assistance to these Centres ; to provide a national display of well designed goods by holding, or participating in, exhibitions and to conduct publicity for good design in other appropriate forms ; to co-operate with the education authorities and other bodies in matters affecting

the training of designers ; to advise, at the request of Government departments and other public bodies, on the design of articles to be purchased by them, and to approve the selection of articles to be shown in United Kingdom Pavilions in international exhibitions and in official displays in other exhibitions ; and to be a centre of information and advice both for industry and for Government departments on all matters of industrial art and design.

The functions of the Design Centres, whose activities the Council co-ordinates, are : To study the problem of design in relation to the products of the particular industry ; to collect and make available to the industry information relating to changes in public taste and trade practice in home and overseas markets and to hold exhibitions both at home and overseas ; to conduct and encourage research and experiment in the design of the products of the industry ; and to co-operate with the education authorities and other bodies for the training of designers and in the provision of special equipment, prizes and grants, and to arrange factory visits and training in factories for art students.

Grants to Design Centres are made by the Board of Trade, after consulting the Council, on a similar basis to that adopted by the Department of Scientific and Industrial Research for Research Associations.

Firm proposals for the formation of Design Centres have been received from the British Rayon Federation for the rayon industry ; the Silk and Rayon Users' Association (Inc.) for the silk industry ; and the trade associations for the jewellery industry, working through the Worshipful Company of Goldsmiths.*

Discussions are actively proceeding with many other industries.

BRITAIN CAN MAKE IT EXHIBITION

This Exhibition, which was opened by H.M. the King on 24th September and closed on 31st December, was organised by the Council. It covered the whole range of consumer goods and selection was carried out for the Council by about twenty Selection Committees, under the general chairmanship of Lord Woolton, each committee being assisted by technical assessors appointed by the industries concerned. Submissions totalled 15,836 articles from 3,385 firms, of which 5,259 articles from 1,297 firms were selected. Manufacturers indicated that by the end of 1946, 50 per cent. of the goods in the Exhibition would be available to some extent for the home market and more than 60 per cent. for export.

Nearly one and a half million people visited the Exhibition and trade orders were received in great volume from Great Britain and overseas, inquiries and orders being almost equally distributed between home and export buyers.

Some 70 or 80 designers were responsible for the decor of the various sections of the Exhibition, working under the supervision of the Chief Exhibition Designer, James Gardner and the consulting architect, Basil Spence, A.R.I.B.A., F.R.I.A.S.

The Council makes an Annual Report on its activities, which is presented by the President of the Board of Trade to Parliament.

* A combined Research and Design Centre has now been set up under the aegis of the D.S.I.R. and the Council of Industrial Design, *see Research Associations under the aegis of the D.S.I.R.*, Section 5.

Forestry Commission

25, Savile Row, London, W.1.

Telephone : Regent 0221.

Chairman : Sir Roy Lister Robinson, O.B.E.

Director of Research and Education : W. H. Guillebaud

THE Forestry Commission, established by the Forestry Act of 1919, is the Government department responsible for establishing state-owned forests and assisting private owners of woodlands by means of grants, advice and research. It now holds 1,364,000 acres of land scattered over England, Scotland and Wales in 274 forest units; 498,000 acres are already under tree crops, whilst a further 150,000 acres have been afforested by private owners. Five National Forest Parks have been created, three schools opened for training foresters, and one thousand cottage smallholdings set up for forest workers.

Under its fifty-year plan for restoring Britain's forests, the Commission aims at 5 million acres of economic woodlands, enough to produce one-third of the country's annual requirements of timber.

Research is undertaken into the problems of raising forest trees in nurseries, the formation of new plantations, the rate of growth of timber crops, and the utilisation of produce. Other subjects investigated are Forest Entomology and Pathology, Forest Botany, Ecology, and Pedology. In order to study the widely varying factors affecting tree growth, it has been found essential to establish experimental plantations at forests distributed over most of Britain. A new Research Centre has recently been opened at Alice Holt Forest, near Farnham, Surrey, whilst contact is maintained with those universities and research bodies concerned with like subjects. Results of research work are published from time to time by H.M. Stationery Office.

Operations other than Research are controlled by the three Directors of Forestry (*see* Section 3). Under the Dedication of Woodlands scheme, estate owners are invited to enter into a covenant to manage their woodlands scientifically so as to ensure timber production in perpetuity. In return they receive financial assistance, and advice from the Commission's technical officers.

General Post Office

St. Martin's-le-Grand, London, E.C.1.

Telephone : Headquarters 1234.

Postmaster General : The Right Hon. Wilfred Paling, P.C., M.P.

POST OFFICE RESEARCH STATION

THE Research Branch of the Engineering Department of the Post Office is housed in premises specially built and equipped for the purpose at Dollis Hill in North West London. A great variety of work is carried out here directed towards the improvement and economical working of the Post Office services. The establishment contains laboratories, specially constructed and lined with sound-absorbing material, fitted up for fundamental acoustic measurements by which the standards of performance of telephonic apparatus can be checked. Other laboratories are provided for investigation of chemical, physical and metallurgical properties of materials used, or likely to be of use, for telecommunications and postal services. These

laboratories are equipped with modern x-ray, photometric, spectrographic and metallurgic apparatus. Here, for example, even minute particles of material can be analysed qualitatively and quantitatively by means of the quartz spectrograph for the detection of impurities. These laboratories are also engaged in the search for new substances with improved mechanical and electrical properties; the determination of the cause of such failures as occur and the investigation of methods by which cause of failure can be avoided in the future.

The establishment is responsible for the testing, calibration and maintenance of apparatus required for the Post Office reference standard of telephonic transmission to enable the performance of normal types of telephone apparatus to be appraised in comparison with this standard. In addition to these fundamental investigations, other laboratories are provided for the development of apparatus and equipment. In some cases the models produced in these laboratories form the prototypes of equipment which is then turned over to outside contractors or to the Post Office factories for bulk production. In other cases the laboratories produce those items of special equipment required singly, or in relatively small numbers which the P.O. factories and outside manufacturers, organised for quantity productions, are not so well fitted to produce. A typical example of the latter class is the "Talking-Clock" used to provide the time service distributed to telephone subscribers. These clocks contain features not found on any other similar equipments in the world and all four in use were produced at Dollis Hill.

The development laboratories include laboratories for telegraph apparatus, for telephone apparatus, for automatic telephone switching apparatus, for line transmission equipment and for telephone signalling equipment.

An important development carried out by the last-mentioned laboratory in recent years has been the production of a two-tone voice frequency signalling equipment which has enabled the dialling of a distant subscriber on an automatic exchange to be carried out over a trunk telephone line (which cannot carry the direct current pulses used locally for this purpose). The system has been introduced throughout the country with the result that large economies in operating staff have been made possible. For example, a trunk operator in the London exchange can call a subscriber on a Manchester exchange without calling in the aid of a Manchester operator.

As an example of the work carried out by the transmission development group may be cited the submarine cable repeater. This consists of a multi-valve amplifier which can be inserted in a submarine telephone cable and lies on the sea bottom. Power to work the amplifier is supplied through the cable over the conductor which also carries the telephone circuits. The insertion of a repeater of this kind reduces the effect of the loss of energy in the cable and allows of a large increase in the number of telephone circuits which can be worked over the cable. The first submerged repeater in actual use was laid in the Irish Sea and another has since been laid in the North Sea.

There are also groups which provide services for the laboratories as a whole such as, for example, a mathematical group which undertakes the solution of problems requiring investigation or computation of an advanced character; a photographic group which meets the special needs of the laboratories, not only in regard to the production of photographs of apparatus,

microscopic specimens, etc., required for reports, but also deals with the special photographic technique involved in the recording of sounds such as, for example, in the preparation of the discs used in connection with the talking-clock.

In addition there is a services group which deals with the maintenance of all services including the running of the well-equipped engineering and woodworking shops which form an essential feature of the establishment.

The Research Branch includes among its responsibilities the custody of the Engineer-in-Chief's library. This is of a comprehensive character covering the technical and other literature on all phases of science and engineering related to Post Office activities. The site at Dollis Hill also contains some of the development laboratories of the Radio Engineers whose activities are concerned with the development of new types of radio senders and receivers and associated equipment including quartz resonators used for radio and other purposes; speech-secrecy devices used on overseas telephone services; and the maintenance of standards of frequency of very high precision for the measurement of wave-lengths of senders. The frequency standard provided and maintained by these laboratories is now so stable that it is proving to be more constant as an indicator of time than the rotation of the earth, and similar equipment has been supplied to the Royal Observatory. Many of the services provided by one branch are shared by the other.

Government Chemist

Government Laboratory, Clement's Inn Passage, London, W.C.2.

Telephone: Holborn 6882.

Government Chemist: G. M. Bennett, M.A., Sc.D., F.R.I.C.

Deputy Government Chemist: J. R. Nicholls, D.Sc., F.R.I.C.

THE Department of the Government Chemist is an independent department under the Treasury and affords advice and assistance in matters involving chemical knowledge to the various departments of State. Work is not accepted from private sources but must be submitted by some department of the Crown or by Parliamentary and departmental committees or in accordance with statutory provisions. Contact is maintained, however, with many branches of industry through the departments more directly concerned *e.g.*, Ministry of Agriculture, Ministry of Supply, Ministry of Food, Ministry of Health, Board of Trade, Commissioners of Customs and Excise, etc. A Report on the work of the Government Laboratory is issued annually by the Stationery Office.

Medical Research Council

38, Old Queen Street, Westminster, London, S.W.1. Tele.: Whitehall 4884.
Chairman: The Right Hon. Lord Balfour of Burleigh, D.L.

THE Medical Research Council was established by Royal Charter in 1920, in succession to the Medical Research Committee (National Health Insurance) established in 1913. It is subject to the general direction of a Committee of Privy Council, consisting of the Lord President as chairman

and of the ministerial heads of departments concerned with different aspects of public health, and is financed by a direct Parliamentary grant-in-aid (at present £498,000 per annum), supplemented by payments from other sources for special purposes, and from funds of private origin coming to the Council by gift or bequest. Nine scientific and three other members are appointed by the Committee of Privy Council, and retire in rotation. It is assisted by numerous technical committees in special subjects, including the Industrial Health Research Board.

The constitution gives full liberty to pursue an independent scientific policy for the advancement of knowledge towards the relief of human suffering. In addition, investigations are undertaken into immediate practical problems at the request of administrative departments, and advice is given to the Government on matters involving the latest scientific information. The field covered includes not only problems of disease but also questions of normal health and efficiency.

A research programme is carried out by the Council's scientific staff, either in the Council's own establishments or attached to other institutions, and by recipients of temporary grants for particular investigations in universities, hospitals and elsewhere. The principal establishment is the National Institute for Medical Research (Hampstead and Mill Hill).

The Council's Reports are published by H.M. Stationery Office, and are obtainable through any bookseller ; but the results of much of the research work appear in the ordinary scientific periodicals.

INDUSTRIAL HEALTH RESEARCH BOARD. The Board is appointed by the Medical Research Council and has had the following terms of reference since July 1942 : To advise and assist the Medical Research Council in promoting scientific investigations into problems of health among workers, including occupational and environmental factors in the causation of ill-health and disease, and the relation of methods and conditions of work to the functions and efficiency of body and mind ; and in making known such results of these researches as are capable of application to practical needs.

Metropolitan Water Board

New River Head, London, W.C.1.

Telephone : Terminus 3300.

Chairman : Harold Gibbons, C.B.E., J.P.

THE Metropolitan Water Board was created by the Metropolis Water Act of 1902. It is composed of 66 members, appointed by the Constituent Authorities of the Water Area, the members holding office for three years. The present Board is the fourteenth ; it came into office on 1st June, 1946.

AREA OF SUPPLY. The Statutory area of supply covers 576 square miles and comprises six administrative counties, namely, the whole of the Administrative County of London, and parts of Essex, Herts., Kent, Middlesex and Surrey.

BULK SUPPLIES. Supplies in bulk are afforded by agreement to various adjacent water undertakings.

SOURCES OF SUPPLY. The water supply is obtained from the Rivers Thames and Lee and from wells and springs mainly in the Kent and Northern areas.

AVERAGE DAILY SUPPLY. The average daily supply, inclusive of bulk supplies, for the year ended 31st March, 1946, was 310·7 million gallons.

Of this quantity about two-thirds came from the Thames and one-sixth from each of the other sources. Thames-derived water is abstracted at intakes above Teddington Weir, stored in reservoirs and afterwards filtered and chemically treated before being sent into supply.

CHARGES. Domestic $8\frac{1}{2}$ per cent. on net annual value for year ending 31st March, 1947, Metropolitan Water Board (Charges) Acts 1907 to 1921 and Metropolitan Water Board Acts, 1927 and 1929.

RESEARCH. The Board's laboratories carry out daily analyses of samples, collected in the distribution system and on the works, to check the purity of the water supplied to consumers and to check the efficiency of the various purification processes. Bacteriological, chemical and biological researches in connection with the purification and examination of domestic water supplied are also carried out in the laboratories.

National Coal Board

*Lansdowne House, Berkeley Square, London, W.1. Tel. : Grosvenor 4070.
Scientific Department and Establishment Branch : Hobart House, Grosvenor
Place, London, S.W.1.*

Chairman : The Right Hon. Lord Hyndley, G.B.E.

*Director-General of Research : W. Idris Jones, B.Sc., Ph.D., F.R.I.C.,
M.I.Chem.E.*

THE Coal Industry Nationalisation Act, 1946, received the Royal Assent on 12th July, 1946, and the National Coal Board, consisting of a Chairman, Deputy Chairman and seven functional members, was constituted on 15th July. On the primary vesting date, 1st January, 1947 the Board took over the coal mining industry.

Eight Divisional Boards have now been appointed. The aims of the Board, as stated in the Coal Industry Nationalisation Act 1946, are : (a) Working and getting the coal in Great Britain, to the exclusion (save in this Act provided) of any other person ; (b) securing the efficient development of the coal-mining industry ; and (c) making supplies of coal available, of such qualities and sizes, in such quantities and at such prices, as may seem to them best calculated to further the public interest in all respects, including the avoidance of any undue or unreasonable preference or advantage.

Dr. Idris Jones, Director-General of Research, who is engaged in scientific work under Sir Charles Ellis, F.R.S., Scientific Member of the Board, will be assisted in research activities by several directors.

Royal Commission for the Exhibition of 1851

1, Lowther Gardens, Exhibition Road, London, S.W.7.

*Telephone :
Kensington 3665.*

President : Her Royal Highness The Princess Royal, C.I., G.C.V.O., etc.

THE Commissioners for the Exhibition of 1851, after winding up the affairs of the Great Exhibition, were appointed under a supplemental Charter as a permanent body to deal with the surplus funds at their disposal in promoting the knowledge of science and art and their application in productive industry.

By the application and administration of this surplus, which amounted to £186,000, the Royal Commission has succeeded in creating a great educational centre at South Kensington. The attention of the Commissioners has not, however, been engaged solely in maintaining and developing the use of their estate for the purposes for which it was purchased with the profits of the Great Exhibition. During the past 50 years their improved financial position has enabled them to extend the scope of their activities by the establishment of scholarships for advanced study and research in science and art, and by the promotion of other schemes of national value intended to further the objects for which they were incorporated. Thus, as pioneers, the Commissioners have been able from time to time to open up new fields of educational activity.

The Commissioners' contributions to public purposes are estimated at nearly £2,000,000 and it is impossible to appraise the value of the benefits to national education which have sprung from these endowments of land, buildings and money. The Commissioners still possess an estate and other capital resources together exceeding £800,000 in value and a gross income of £26,000 a year.

Scholarship schemes are endowed not for all time but for so long as it may appear desirable to the Commissioners to test the value of the opportunities they afford.*

Science Museum

South Kensington, London, S.W.7.

Director : H. Shaw, D.Sc., A.R.C.S.

Telephone : Kensington 6371.

THE Science Museum dates from 1856 when a collection illustrating Science and Art was transferred from Marlborough House to premises built by the Royal Commissioners of the Exhibition of 1851 on ground purchased in South Kensington. In 1864 a collection of naval models and marine engines formed at South Kensington, illustrating boat construction and marine engineering, was the foundation of the present collection. A collection of physical and mechanical instruments was added in 1875 and since that time aeronautics, mining, metallurgy, hand and machine tools, electrical engineering, mathematical instruments, optics, geodesy, surveying, chemistry, automobiles and all branches of Industry are represented in the Collections.

The Museum was closed to the public during the war, a nucleus staff being retained and the workshops used for war production. For some time the premises were occupied by R.A.F. Classes. The majority of the exhibits were evacuated to various places in the country for greater safety. The Science Library, however, was open continuously and many Allied representatives utilised the opportunities offered for research work. The Library contains books, periodicals, transactions, bulletins, etc. both British and foreign, dealing with all branches of pure and applied science (except medicine), and is in charge of a scientific staff. The literature is available to the public in the reading-room, or obtainable on loan through the medium of an approved institution or industrial organisation.

* For details of scholarships see *Careers in Professions Associated with Industrial Research*.

The present collections on view include stationary engines, locomotives, aeronautics, mathematics, astronomy, chemistry, photography and cinematography, electrical and acoustical instruments, surveying, thermal instruments, meteorology, sailing ships, merchant steamers, small craft, time measurement and The Children's Gallery. Special Exhibitions, lasting about three months, are held.

Public Lectures are given each day (except Sundays) at 11.15 a.m. and 3.15 p.m. by the Guide Lecturers. Hours of opening are 10 a.m. to 6 p.m. on weekdays ; 2.30 to 6 p.m. on Sundays. Admission free.

Inquiries should be addressed to the Director.

Scottish Council (Development and Industry)

20, George Street, Edinburgh, 2.

Telephone : Edinburgh 33687-8.

President and Chairman of Executive : Sir Steven Bilsland, Bt., M.C., D.L.

THE Scottish Development Council, established in 1935, and the Scottish Council on Industry, established in 1942, have now been merged into The Scottish Council (Development and Industry).

The primary aims of the new Council, as defined in its constitution, are : (1) To maintain a continuous survey of industrial development and trends and to assist in promoting the best economic development of Scotland ; (2) to examine, and advise the Secretary of State for Scotland in regard to the industrial, commercial, and economic problems of Scotland, on which action may be needed, particularly with a view to securing that the natural resources, capacity and labour of Scotland are properly utilised and that the position of Scotland is fully safeguarded ; and to take such steps as may be necessary to endeavour to arrive at a solution of these problems and to achieve the objects of the Council ; (3) to arrange, in consultation with the Secretary of State, for such inquiries and research into particular problems of development as may be desirable in view of their special importance to Scotland ; (4) to take such other action as may be desirable to promote the well-being of the people of Scotland.

The Council is directly representative of the local authorities, the chambers of commerce, the trades unions and the banks, and membership is open, in addition, to all kinds of corporate bodies, including firms, co-operative societies and trades councils, to a wide range of office bearers in various walks of Scottish life, and to private individuals. In pursuing its aim of promoting prosperity in Scotland, the Council will co-operate closely with its own constituent bodies, with the Secretary of State for Scotland and his departments, with other Government departments and with agencies, such as the Scottish Regional Board for Industry, the Regional Distribution of Industry Panel, the Scottish Committee of the Council of Industrial Design, the Scottish Tourist Board, the North of Scotland Hydro-Electric Board, and the Scottish Herring Industry Board. It is intended to open a bureau in London, possibly in conjunction with the Scottish Tourist Board.

The Council will welcome useful suggestions and constructive ideas and will endeavour to give the best possible service in the cause of Scottish prosperity. Inquiries should be addressed to the Secretary, C. Macrae, D.Phil. (Oxon.), at the above address.

Commonwealth and Overseas

Imperial Institute

South Kensington, London, S.W.7.

Telephone : Kensington 3264.

Director : Sir Harry Lindsay, K.C.I.E., C.B.E.

THE Imperial Institute was established :

To promote the commercial, industrial and educational interests of the British Empire.

To collect and disseminate : (a) Information relating to possible uses of and markets for new raw materials or semi-manufactured products ; (b) information relating to new uses of and markets for already known raw materials or semi-manufactured products ; (c) information relating to sources, production, supplies, cost, consumption and requirements of raw materials and semi-manufactured products and legislation relating thereto ; (d) information relating to the best means of increasing supplies or of creating new sources of supplies of such materials and products within the Empire ; (e) information relating to the best means of treating such materials and products and of preparing them for marketing ; (f) technical and scientific information bearing upon the industries of the British Empire.

To advise on the development of the resources of the Empire in raw materials in order that such resources may be made available for the purposes of industry and commerce and of Imperial defence.

To conduct in the laboratories of the Institute preliminary investigations of raw materials and, when it may be deemed advisable, to arrange for more detailed investigation by appropriate scientific or technical institutions.

To collect samples of raw materials having a definite value in industry and commerce.

To co-operate with other agencies within the Empire formed for similar purposes.

To maintain for public information and instruction in the exhibition galleries of the Imperial Institute exhibitions illustrative of the resources and development of the Empire and of its scenery, life and progress and where practicable to organise from time to time temporary exhibitions of a similar nature elsewhere.

To do anything incidental to or conducive to carrying into effect all or any of the foregoing purposes.

SCIENTIFIC AND TECHNICAL WORK. This is carried out by three principal Departments, *viz.*, the Plant and Animal Products Department, the Mineral Resources Department and the Rubber Research Department (Ceylon and Malaya).

INTELLIGENCE. Special sections deal with inquiries relating to the sources, production, uses and marketing of raw materials, and with the collection and dissemination of general and statistical information concerning them.

INVESTIGATIONS. The laboratories are specially equipped for the chemical and technical examination of raw materials of all kinds with a view to determining their possible uses and value. Full reports are furnished on the composition, commercial utilisation and value of materials submitted.

ADVISORY COUNCILS AND CONSULTATIVE COMMITTEES. A number of technical committees, consisting of authorities on various groups of raw materials and acting under two Advisory Councils, co-operate in the work of the Plant and Animal Products Department and the Mineral Resources Department, and close touch is also maintained with producers, brokers, merchants and users. Valuable help can thus be given to persons interested in the development of Empire raw materials. The research work of the Rubber Department is controlled by its own London Advisory Committee.

PUBLICATIONS. Numerous publications of an authoritative character, including the quarterly *Bulletin*, are issued containing information about raw materials and related industries.

LIBRARY. The library of the Institute contains a large collection of works of reference relating to raw materials and their uses, and is regularly supplied with the more important official publications of all countries of the Empire and of many foreign countries and with over 800 technical and scientific periodicals. The library is open to inquirers from 10 a.m. to 5 p.m. on weekdays (Saturdays 10 a.m. to 1 p.m.).

No charge for assistance is made to departments of the United Kingdom Government or other Governments of the Empire (or their nationals) contributing to the general funds of the Institute, unless any particular inquiry should involve a volume of work so great that it cannot be undertaken by the existing staff.

PLANT AND ANIMAL PRODUCTS DEPARTMENT

The Department deals with inquiries received from Government departments, overseas Empire countries, and from commercial and private sources in the United Kingdom.

There are eight Consultative Committees dealing with various groups of economic products. Laboratory investigations include the examination of paper-making materials, fibres, oils and oilseeds, essential oils, foods and feeding-stuffs, resins, gums, spices, drugs, tobacco, tanning materials and insecticides.

The Intelligence Section deals with inquiries from all parts of the Commonwealth and is responsible for collecting from technical and other publications, and indexing, information on plant and animal products likely to be of service in the work of the Institute. This section also prepares the quarterly bibliography of insecticide materials of vegetable origin, which is distributed in Britain and overseas.

Close contact is maintained with the Colonial Products Research Council and the British Standards Institution.

MINERAL RESOURCES DEPARTMENT

The Department provides a technical and commercial intelligence service, publications, a statistical service, a laboratory investigation service and a mining law service. Technical assistance is given by the Consultative Committees, comprising professional and business men.

The Intelligence Section is responsible for the collection and dissemination of technical and commercial information relating to mineral deposits in all parts of the world, and supplies information to Government departments, mining firms, trading companies and consumers in the United Kingdom

and overseas. The section is also responsible for the compilation of monographs and a *Statistical Summary of the Mineral Industry of the British Empire and Foreign Countries*, published by the Institute.

Close contact is maintained with Geological Surveys, Mines Departments and other official bodies concerned with mineral developments in the overseas Empire.

RUBBER DEPARTMENT

The London Advisory Committee for Rubber Research directs the work of the Rubber Department, which was financed before the war by official rubber research organisations in Malaya and Ceylon and was associated with them in improving the suitability of plantation rubber for manufacturers' processes, and in agricultural developments on estates and small-holdings. The Committee has recently been making plans for improved post-war rubber and has been considering the technical advantages of preparing and packing rubber in large-scale central factories instead of on individual estates.

A new inspection apparatus using polarised light, devised and constructed at the Imperial Institute, has made possible the selection of clean rubber with speed and accuracy. The apparatus may also be of value for inspecting and grading plantation rubber.

Inquiries should be sent to J. A. Nelson, Secretary, London Advisory Committee for Rubber Research (Ceylon and Malaya), Imperial Institute, London, S.W.7.

British Commonwealth Scientific Office, North America (B.C.S.O., North America)

1785, Massachusetts Avenue, N.W., Washington 6, D.C. Tel.: DEcatur 9000.
Branch Office: 43, Exchange Place, New York, N.Y. Tel.: HANover 2-2460.

THE Commonwealth organisation for scientific representation in North America, the British Commonwealth Scientific Office, North America, (generally known as "B.C.S.O.") continues, both in its constitution and its scope, the machinery set up in America during the war, first as the British Central Scientific Office, and later as the B.C.S.O., Washington, to facilitate scientific collaboration between the United Kingdom, the Dominions and the U.S.A.

In the previous edition of this book it was stated that the peacetime policy and organisation of the B.C.S.O. were being considered. Although future policy would ultimately be a matter for the several participating Governments, the meetings of the Royal Society's and Official Scientific Conferences, in June-July 1946, provided convenient and appropriate opportunities for Governments to ascertain the views of science on the continuance of the Office. In the course of the discussions it became abundantly clear that in various connections the B.C.S.O. machinery was regarded as a most important mechanism for facilitating scientific collaboration. Both Conferences expressed the opinion that it was a valuable and

necessary element in the permanent machinery for scientific liaison and they invited the Governments concerned to continue the Office in Washington, with a scope and constitution substantially unaltered. A proposal of the U.K. Government to set up a similar Office in London was also strongly endorsed. Experience had in fact shown that after the transitional period following the end of the war, although the objectives were changed to peacetime applications of science, the potential scope of the Washington Office was certainly not less extensive and only limited by the staff resources available.

The constitution of B.C.S.O. is simple but effective. From the time of its inception as a formal Commonwealth Office it has consisted essentially of a number of Dominion Scientific Missions or Liaison Offices housed with the U.K. Scientific Mission under a single roof, collaborating freely and enjoying common central services, but each retaining its full autonomy and independence under the jurisdiction of its parent government.

The main functions of the Office may be summarised as assisting and serving as a centre for scientists visiting North America on behalf of Government Departments, also similarly helping properly sponsored non-official scientific visitors so far as circumstances permit; maintaining close liaison with Government and other research institutions and technical bureaux in the U.S.A.; obtaining prompt and comprehensive answers to questions asked by home departments; stimulating and maintaining exchange of scientific and technical information in each direction; keeping abreast of new developments and changes in policy and organisation on scientific matters in the U.S.A. and keeping home departments informed; facilitating supply within certain limits of books, chemicals, scientific apparatus and biological materials for official purposes in the parent country; arranging for Anglo-American collaboration on research projects where appropriate, including exchange visits of specialists; miscellaneous cultural scientific activities.

The total numbers of scientific staff attached to the several Missions, as well as the sciences represented, vary from time to time. At present complements cover some twenty resident scientists, of which some nine are in the U.K. Scientific Mission, and in addition there are frequently visiting scientists temporarily attached to the Office. The subjects at present covered by the Office include aerodynamics; agricultural problems; animal health; biology; building research; chemistry; entomology and insecticides; engineering (including jet propulsion developments); food (including fruit storage and processing); industrial wastes; metallurgy; nutrition; oil and petroleum products; organisation of science in U.S.A. and Canada; packaging; physics (including nuclear physics); plastics (including rubber and high-polymer chemistry); radio; textiles. At present also there is attached to the U.K. Scientific Mission a group working on scrutiny of enemy technical documents.

In the case of the U.K. Scientific Mission the practice is to appoint scientists for periods varying from six months to two years according to circumstances, and to select them in turn from various branches of science as dictated by the particular needs of the moment. The bulk of the staffs work from Washington, but certain staff are attached to the New York branch office, which also serves as a convenient initial contact point for visitors on arrival in America.

Colonial Products Research Council

Imperial Institute, London, S.W.7.

Telephone : Kensington 3264.

Chairman : The Right Hon. Lord Hankey, G.C.B., G.C.M.G., G.C.V.O.,
F.R.S.

THE decision to create the Colonial Products Research Council was taken by the Secretary of State for the Colonies in 1941, and the Council was finally constituted in January 1943.

The Council is independent of, though closely associated with, the Colonial Research Committee. Unlike the Committee it is an executive body, it organises research and has its own Director of Research. The Terms of Reference of the Council are :

To review the field of Colonial production and to advise what Colonial raw materials are likely to be of value to the manufacture of intermediate and other products required by industry ; in consultation with the Director, to initiate and supervise researches, both pure and applied, on such products, and generally to consider how by the application of research greater use can be made of them.

In framing their programme the Council will have as their objective the promotion of the welfare and prosperity of Colonial peoples, and will endeavour also to increase the Colonial contribution to the welfare and prosperity of the British Empire and of the world as a whole. The Council will ensure that full use is made of existing research organisations, in particular the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council. In formulating its research policy, it will also call into consultation persons with expert knowledge in science, industry and other related fields.

The Council and the research schemes inaugurated by it are financed from funds voted under the Colonial Development and Welfare Act 1940. The Council's task, as it conceives it, is a double one. Primarily it has to examine the raw products of the Colonial Empire and discover new uses for them, whereby the demand for those products will be increased and made steadier, and better prices will be realised. In addition, it must always bear in mind the fact that the low standard of living of Colonial peoples is, at any rate in part, due to the fact that they are almost without exception primary producers and, therefore, do not enjoy the higher standards which can, generally speaking, be attained only by industrial activity. It must, therefore, be constantly alive to the possibility of developing techniques whereby Colonial peoples may not only produce primary products but also convert them into secondary products of greater value, both for internal consumption and for export.

The research so far initiated includes *inter alia* a study of the chemistry of sugar, starch, vegetable oils, essential oils, timber and petroleum. The majority of these researches are likely to take a considerable time before coming to fruition and immediate results are not likely to accrue.

The Council decided to open a Colonial Microbiological Research Institute in Trinidad and work on its building has now started. Dr. A. C. Thaysen of the Chemical Research Laboratory, Teddington (who has been responsible for the research upon which the establishment of the Food Yeast

Factory in Jamaica is based) has been seconded to work under the Council and will direct the research of this new laboratory. Dr. Thaysen has already paid several visits to the West Indies and is now in Trinidad supervising the construction of the Institute.

The Council places great emphasis on the importance of maintaining the closest touch with workers in the Colonies themselves, and to this end the Director of Research and Sir Ian Heilbron recently paid a visit to East and South Africa. The Director of Research and Sir Robert Robinson had earlier visited the Caribbean, and visits to other parts of the Colonial Empire are envisaged in the future.

Apart from the Microbiological Research Institute referred to above, the Council has no research institution of its own, but, for the present, conducts its investigations in existing Government and university laboratories.

The Council published its First Annual Report in May 1944. (Cmd. Paper No. 6529).

Australia: Council for Scientific and Industrial Research

Head Office : 314, Albert Street, East Melbourne, C.2., Victoria

Minister-in-Charge : The Hon. J. J. Dedman, M.P.

THE Council for Scientific and Industrial Research was established by the Commonwealth Government in 1926 to carry out scientific research for the promotion of the primary and secondary industries of Australia.

The Council consists of (a) five members nominated by the Commonwealth Government (one of whom is chairman) (b) the Chairmen of the six State Committees of the Council and (c) other members co-opted by reason of their scientific knowledge. The Commonwealth Government nominees form an Executive Committee which exercises all the powers and functions of the full Council between its meetings.

For almost twelve years after its establishment the work of the Council was devoted mainly to the solution of problems affecting the agricultural and pastoral industries. However, in 1937 the Commonwealth Government decided to extend the activities of C.S.I.R. so as to provide assistance to manufacturing industries. The Council then proceeded to establish several laboratories for work in that field and was thus able to render to Australian secondary industries assistance of vital importance almost immediately after the outbreak of war in 1939.

For the purpose of carrying out its research work the Council has established Divisions and Sections as listed hereunder. The Divisions comprise the major establishments for which special laboratory buildings have been erected and equipped; the Sections generally include establishments which have not reached a stage of development, so far as scope and magnitude of their operations are concerned, to justify their designation as Divisions.

The Divisions which have been established are as follows :

- (1) Plant Industry, with main laboratories at Canberra and field stations;
- (2) Economic Entomology, also with main laboratories at Canberra and field stations;
- (3) Animal Health and Production, with

main laboratories in Melbourne and Sydney and field stations; (4) Biochemistry and General Nutrition, with main laboratories at Adelaide and field stations; (5) Soils, also with main laboratories at Adelaide and extensive operations in the field; (6) Forest Products, with main laboratories in Melbourne and field experiments; (7) Food Preservation and Transport, with main laboratories at Homebush, New South Wales, and a subsidiary laboratory in Brisbane; (8) Fisheries, with main laboratories at Cronulla, New South Wales, and experimental work in coastal waters of Australia; (9), (10), (11) National Standards Laboratory at Sydney—Divisions of Metrology, Physics, and Electrotechnology; (12) Radiophysics Laboratory, with main laboratory at Sydney and subsidiary laboratory at Melbourne, and operational research groups; (13) Aeronautics, with laboratories in Melbourne; (14) Industrial Chemistry, with laboratories in Melbourne.

The following are the Sections:

- (1) Research Station, Murray Irrigation Area, Merbein, Victoria;
- (2) Irrigation Research Station, Griffith, New South Wales;
- (3) Lubricants and Bearings, Melbourne;
- (4) Dairy Products, Melbourne;
- (5) Mineragraphic Investigations, Melbourne;
- (6) Ore-dressing Investigations, Melbourne, Adelaide and Kalgoorlie;
- (7) Mathematical Statistics, Adelaide;
- (8) Flax Research, Highett, Victoria;
- (9) Building Materials Research, Highett, Victoria;
- (10) Meteorological Physics (in process of formation).

In addition to its investigational work the Council maintains an Information Service which deals with inquiries on a wide range of scientific and technical subjects, and a central library at the Head Office. Scientific Research Liaison Offices in London and Washington have been established by the Council.

National Research Council of Canada

Ottawa, Ontario, Canada.

Telephone : Ottawa 9-4464.

President : C. J. Mackenzie, C.M.G., M.C., D.Eng., D.Sc., LL.D., F.R.S.C.

THE Honorary Advisory Council for Scientific and Industrial Research, usually known under the authorised short title, National Research Council, operates under an Act of Parliament of the Dominion of Canada, Chapter 177 of the revised Statutes of Canada 1927. This Act constitutes the Council a body corporate and provides that the Council have charge of all matters affecting scientific and industrial research in Canada, which may be assigned to it by the Committee of the Privy Council on Scientific and Industrial Research, and shall also have the duty of advising the Committee on questions of scientific and technological methods affecting the expansion of Canadian industry or the utilisation of the natural resources of Canada. Without limiting the general powers of the Council, the Act also sets forth in some detail specific powers which may be exercised by the Council.

The National Research Council consists of 20 members selected from among men prominent in scientific work in Canadian universities or industry, and is broadly representative of all parts of Canada and includes persons qualified to speak authoritatively on education, science, industry, labour,

business and finance. There is a President, appointed by the Governor-in-Council for a term of years, who reports direct to the Committee of the Privy Council on Scientific and Industrial Research.

The Council is not a part of a Government department; it is a corporate body capable of acquiring and holding money and property and of administering trusts related to science and research. An important advantage which comes from the type of organisation prescribed is the facility afforded for collaboration and co-operation with the scientific services maintained by the departments of State as a necessary consequence of their administrative duties. In addition, as a chartered corporation, the Council is able to deal with industry directly in negotiating agreements for the utilisation of the results of research.

In order to correlate the work of all Canadian research organisations concerned with specific problems or groups of problems, a number of Associate Committees have been set up. These committees have been organised as a result either of the need for co-operative effort on a problem or for the study of the research needs and facilities in a given field, and the subsequent development of a programme to meet the needs by the most efficient use of the facilities available. Obviously the latter requirement involves a great deal of co-operation, and it has been the aim of the Council to foster that co-operation among scientific workers in universities and in other institutions, including Government organisations. Under this policy, hundreds of men with scientific or industrial training have associated themselves with the Council in the work to which this training can give the greatest impetus and have pooled their knowledge without reserve.

There are approximately 50 such committees in operation at present, each responsible for the planning and direction of work within a specific, assigned field, such as medical research, grain research, storage and transportation of food, aeronautics, forestry research, laundry research, parasitology, radio research, etc.

The Council also operates the National Research Laboratories of Canada which are organised under the following eight main divisions: Physics and Electrical Engineering; Mechanical Engineering (including Aeronautics); Chemistry; Applied Biology; Medical Research; Atomic Energy; Building Research; and Information Services.

In addition to work carried on in its own laboratories, the Council also financially supports research in other laboratories throughout Canada, especially in the universities, through grants in aid of research, thus stimulating research activity and utilising the existing scientific personnel and the research facilities to carry on under competent direction many projects of importance, which otherwise would not be undertaken.

For the purpose of encouraging post-graduate training in science, and of building up an adequate supply of trained research workers, the Council grants annually scholarships for post-graduate training in science; 185 such awards were granted for 1946-47. Under these awards graduates of outstanding merit are enabled to follow post-graduate studies and thus to equip themselves for leadership in the application of science to industry in Canada.

The Council is active in the field of invention. It holds patents which develop from its activities and exploits these under public interest, under licence and otherwise.

The Council has also established the *Canadian Journal of Research* for the publication of scientific papers, thus providing an outlet for records of original work in the physical, chemical, botanical, zoological and medical sciences.

It also maintains a central scientific Library which is available to research workers throughout the Dominion.

Co-operation is the key-note of the Council's policy in the promotion of research. Its facilities are available to departments of State, universities and industry alike, and the success that the Council has attained in the field of national research may be attributed in large measure to the hundreds of leading scientists and industrialists, and to Government departments and other organisations who have so freely given their assistance in the furthering of co-operative projects.

Ceylon : Rubber Research Scheme

Dartonfield, Agalawatta, Ceylon

THE Rubber Research Scheme, Ceylon, was established by Ordinance No. 10 in 1930. Its objects are : Furthering and developing the rubber industry ; managing, conducting, encouraging and promoting scientific research in respect of rubber and all problems connected with the rubber industry, and in particular the growth and cultivation of rubber plants ; the prevention and cure of diseases, blights and pests ; the processes for the treatment of rubber latex and the conversion of such latex into marketable rubber ; and the utilisation, marketing and disposal of rubber and, in general, of all products derived from rubber plants.

Funds are derived from cess on exports of rubber from Ceylon. The Scheme is controlled by a Board, consisting of the Director of Agriculture (Chairman), the Colonial Treasurer, three members of the Legislative Council of the Colony, representatives of owners of rubber estates and of smallholders.

The London Advisory Committee for Rubber Research (Ceylon and Malaya) acts as London agents for the above research organisation and advises on its research work. The Advisory Committee also conducts investigations on the quality of plantation rubber in association with the research staffs in the East.*

East Africa : East African Industrial Council

Nairobi, East Africa

THE East African Industrial Council was set up in June 1943 to consider questions relating to industrial development throughout East Africa, with particular reference to the selection, siting and financing of industries required in the four East African Territories of Kenya, Uganda, Tanganyika Territory, and Zanzibar. Decisions of the Council involving legislation or the voting of funds require the ratification of the Legislative Council concerned.

* See Statements of Imperial Institute

The Industrial Council does its practical work through two Boards, the East African Industrial Research Board and the East African Industrial Management Board. The former is primarily concerned with research into suitable industries for East Africa, and the latter with the marketing of the commodities produced by such industries.

Eire : Institute of Industrial Research and Standards

(Department of Industry and Commerce).

45, St. Stephen's Green, Dublin.

Telephone : Dublin 61390.

Director of Industrial Research and Standards : Donal T. Flood, M.Sc.

PROVISION is made in the Industrial Research and Standards Act, 1946 for the establishment and maintenance of an Institute for Industrial Research and Standards. The functions of the Institute as set out in the Act are :

- (a) To undertake, encourage and foster scientific research and investigation with the object of : (i) promoting the utilisation of the natural resources of the State, (ii) improving the technical processes and methods used in the industries of the State, (iii) discovering technical processes and methods which may promote or facilitate the expansion of existing or the development of new industries, and the utilisation of the waste products of industry ;
- (b) to make recommendations to the Minister as to the formulation of standard specifications for commodities, processes and practices and the provision and use of standard marks for commodities, processes and practices which conform to standard specifications ;
- (c) to test and analyse commodities, intended for sale or for use by the public, for the purpose of : (i) advancing or facilitating scientific research and investigation, (ii) ensuring conformity with standard specifications, (iii) encouraging the standardisation of commodities, processes and practices, or generally, with the object of ascertaining, for the public benefit, the characteristics of such commodities ;
- (d) to publish the result of any test or analysis carried out by the Institute or by any other person on its behalf.

The Institute will be composed of : The Council ; The Industrial Research Committee ; The Standards Committee ; and The Director of Industrial Research and Standards.

The Council will have advisory functions. It will meet at least once a year and will have the duty of considering and making observations on the draft annual report and programme of work of the Institute.

The Industrial Research Committee will be charged with the general government of the Institute and the administration of its affairs, subject to the reservations to the Standards Committee and to the Director of Industrial Research and Standards.

The function of the *Standards Committee* will be to formulate specifications for standards for such commodities, processes and practices as the Minister may request.

The duties of the *Director of Industrial Research and Standards*, who will be appointed by the Minister for Industry and Commerce, will be to supervise and direct the conduct of research and the formulation of specifications in conjunction with the Industrial Research Committee and the Standards Committee. The Director may also on his own initiative conduct such researches on behalf of the Institute as he thinks proper.

The new Institute will, it is hoped, place industrial research in this country on a more permanent and autonomous basis. It will be an independent research authority with its own laboratory, equipment and staff and with considerable freedom in the administration of the funds entrusted to it. In view, however, of the limited amount of these funds, its functions will be restricted to the practical problems of Irish industry, i.e., the scientific study of problems affecting particular industries. It is intended that the Institute will carry out researches, investigations, tests and analyses at the request of the Minister and also on its own initiative.

It is considered that the device adopted in the Act of having a Standards Committee as an integral part of the Institute, but as a separate organ, secures the advantages of independence with the economies of combination.

Provision for standardisation is made in Part VIII of the Act. A specification must be prepared by the Institute at the request of the Minister who may then, by order, declare such specification to be a standard specification. Provision is made whereby the Minister may, by order, prescribe a mark for use in connection with a specified commodity to indicate that it conforms to a particular standard specification. The Minister will keep registers of standard specifications and standard marks and may grant licences for the use of standard marks.

Financial resources will be made available to the Institute, out of moneys provided by the Oireachtas, in the following manner :

- (a) Grants of such amounts as the Minister for Industry and Commerce, with the concurrence of the Minister for Finance, may sanction towards defraying the whole or any part of the capital cost of land, buildings and equipment for the Institute.
- (b) An annual grant of £15,000 towards the expenses of the administration of the Institute.
- (c) Grants of such amounts as the Minister, with the concurrence of the Minister for Finance, may sanction for defraying the whole or any part of the costs of special investigations undertaken by the Institute, including the cost of any special equipment.

The Institute has power to employ such staff as is necessary for the performance of its functions. The members of the staff will be appointed and removed by the Director, with the approval of the Industrial Research Committee. The numbers, grades, remuneration, tenure of office and conditions of service of the staff of the Institute will be determined by the Director with the approval of the Minister, given after consultation with the Minister for Finance.

The Institute will be permitted, subject to the approval of the Minister for Industry and Commerce, to provide scholarships and other awards for the training of persons in industrial research. The Institute will have power to render such assistance, financial or otherwise, as it thinks proper to persons undertaking research of a kind which the Institute is itself authorised to undertake. The Institute is empowered to charge, receive

and recover fees for researches, tests, or investigations undertaken by the Institute on behalf of any person, other than the Minister, and to accept gifts of money, land or other property.

The financial affairs of the Institute will be administered by the Industrial Research Committee, which will have the duty of keeping accounts in an approved form, and of submitting such accounts for audit by the Comptroller and Auditor-General, to be duly laid before each House of the Oireachtas. An annual report of the work of the Institute will be prepared by the Industrial Research Committee and duly laid before each House of the Oireachtas.

The Industrial Research Committee and the Standards Committee must submit to the Minister such information regarding their activities as the Minister may from time to time require. Each of these Committees may, with the approval of the Minister, publish scientific information in the name of the Institute.

India : Council of Scientific and Industrial Research

University Buildings, Delhi

Director : Sir S. S. Bhatnagar, O.B.E., D.Sc., F.R.S.

THE Council of Scientific and Industrial Research was set up in India in 1942, and in the following year, to meet the urgent need for increased research facilities in India, the Council prepared plans for the establishment of five national laboratories as follows :

The National Physical Laboratory, Delhi, will consist of nine divisions : Weights and Measures ; Applied Mechanics and Materials ; Heat and Power ; Optics ; Electricity ; Electronics and Sound ; Building and Housing Research ; Hydraulic Research ; and Analytical Chemistry.

The National Chemical Laboratory, Poona, will carry out fundamental and applied research in seven main divisions : Inorganic Chemistry ; Physical Chemistry, including Electro-chemistry ; Chemistry of High Polymers ; Organic Chemistry ; Biochemistry, including Biological Evaluation ; Chemical Engineering ; Survey and Intelligence.

The National Metallurgical Laboratory, Jamshedpur, will cover all aspects of metallurgical research, fundamental and applied and research on ores, minerals and refractories.

The Fuel Research Station, Dhanbad, will deal chiefly with the chemical and physical survey of Indian coals ; processing and preparing coal with special reference to metallurgical coke ; low temperature carbonisation of coal ; and other day to day problems confronting the industry.

The foundation stones of the above four laboratories have been laid and work is progressing.

The Central Glass and Ceramic Institute, Calcutta, will carry out research on the improvement of the existing technique of manufacture of glass and ceramic articles and on the commencement of new processes.

The Council's plans have now been extended to include the establishment of a further six laboratories and work has already commenced on the Road Research Institute, Delhi, which will tackle the problems of highway

engineering in India with a view to introduce the proper use of materials and standards of modern road engineering. The remaining establishments are: Building Research Station, Roorkee (in collaboration with the Thompson College of Engineering); Institute of Leather Technology, Madras (in collaboration with the University of Madras); Institute of Fundamental Research, Bombay (in collaboration with the Tata Institute of Fundamental Research); Institute of Dyestuffs Technology, Bombay (in collaboration with Bombay University); and Research Institute on Internal Combustion Engines, Bangalore (in collaboration with the Indian Institute of Science).

Indian Jute Mills Association Research Institute

16, Old Court House Street, Calcutta.

Telephone : Calcutta 5293.

London Department : 279, Gresham House, Old Broad Street, London, E.C.2.

Tel. : London Wall 1100.

Chairman : I. G. Kennedy, M.L.A.

THE Indian Jute Mills Association Research Institute (IJMARI) is of recent origin, having been originally founded in 1937 as the Research Department of the Indian Jute Mills Association, Calcutta. It was later in 1943 registered as a private company under the Indian Companies Act (1913) and into it the former Research Department was absorbed. The headquarters of the Institute are centrally situated in Calcutta and a branch office with laboratory is maintained in London. The Institute is the official research and development organisation of the jute mill industry in India as represented by the Indian Jute Mills Association which represents 96·3 per cent. of the total loomage strength of all jute mills in India. The Research Institute has included among its objects the following, as taken from the Memorandum and Articles of Association :

(1) To institute, prosecute, develop and carry on all kinds of scientific and economic research in or in connection with processes for the preparation and use of jute, hemp, cotton or any other fibrous material or combination of fibrous materials used for spinning yarn, the preparation and use of jute, hemp, cotton or other yarn for weaving and in the preparation and use of all kinds of woven and other fabrics and textiles manufactured with or from jute, hemp, cotton or other yarn, including finishing and physical and chemical processes either alone or in conjunction with other fabrics, preparations, materials or articles.

(2) To carry out all kinds of scientific and economic investigations and other experiments for the purposes aforesaid and for improving for commercial purposes the manufacture, use and sale of such yarn, fabrics and preparations, materials and articles for use in connection therewith.

(3) To study and promote the application of science and scientific and economic methods to the manufacture of jute or other yarn and fabrics, either alone or in conjunction with preparations or other materials or articles.

(4) To study and introduce to jute mills in India schemes for standardisation and commercial practices in manufacture and to improve the same and extend the use of jute and other fabrics.

(5) To construct, develop and use scientific and chemical, experimental and other laboratories, plant, machinery, and workshops and to employ all kinds of scientists, economists, chemists, engineers, mechanics, technical and other experts in connection therewith.

(6) To make known to the members and others upon such terms as the Association may determine the results of all research discoveries, patents and investigations made in connection with the above objects, and to render services in connection therewith to members and others and to charge therefor or not, as the Association may in any case determine.

(7) To adopt such means of making known the products of the Association as may seem expedient and in particular by advertising in the press, by circulars, by purchase and exhibition of works of art or interest, by publication of books and periodicals and by granting prizes, rewards and donations.

The finances of the Institute are provided solely by the industry and at present 70 mills are listed as members, representing 64,581 looms. The present staff, including the London Branch, numbers 50, of which 20 are qualified scientists and technologists. There is an Advisory Committee in London.

Inquiries should be addressed to the Secretary (Calcutta), Miss C. MacTavish, M.A., as above, or to the Secretary (London Branch), W. G. Atkins, A.M.I.Chem.E., as above.

Malaya: Rubber Research Institute of Malaya

Kuala Lumpur, Malaya

THE Rubber Research Institute of Malaya was established under the Rubber Research Institute of Malaya Enactment 1925, for the purpose of research into and investigation of all problems relating to rubber. The Institute is controlled by a Board consisting of the Director of the Institute as Chairman, officials of local Colonial Governments and other members representing rubber planters and smallholders. Funds are derived from cess on exports of rubber from British Malaya.

The London Advisory Committee for Rubber Research (Ceylon and Malaya) acts as London agents for the Rubber Research Institute and advises on its research work. The Advisory Committee also conducts investigations on the quality of plantation rubber in association with research staffs in the East.*

New Zealand: Department of Scientific and Industrial Research

Wellington, New Zealand

THE Department of Scientific and Industrial Research was constituted in 1926 by act of Parliament, and is in the charge of a Minister of the Crown. Official relations with the Minister are maintained through the Permanent

* See Statement of Imperial Institute

Head of the department who also acts as secretary of the Council of Scientific and Industrial Research.

THE RESEARCH COUNCIL

Under the Scientific and Industrial Research Act a Council of Scientific Research was constituted, which functions as an advisory body to the Minister and exercises general supervision over research work. An annual programme of work is submitted to the Minister together with estimates of the cost thereof for each Scientific Institution and Service under Departmental control. With Ministerial approval the Council appoints Committees to oversee the work of the various Research Associations and Services.

The Council is an advisory not executive body, the Department of Scientific and Industrial Research being the executive organisation through which the Council carries out its functions.

PERMANENT SERVICES comprise the physical and chemical laboratories, observatory services, soil and geological surveys.

RESEARCH COMMITTEES AND ASSOCIATIONS. Research organisations within the Department are under the immediate direction of Advisory Committees responsible to the Council, which must approve all proposals for research and the expenditure involved. These Committees are concerned with investigations which of necessity affect all units of any particular industry. The Wheat Research Institute for example, under the direction of the Wheat Research Committee copes with the problems of growers, millers and bakers: the results of investigations are available to all interested, not only to those contributing financially.

On the other hand Research Associations, again under Council control, are formed by distinct units of Industry which desire to co-operate for the purposes of research, and are prepared to make direct contributions of funds for the purpose. The results are available only to members of the Association.

PERSONNEL. The Council members are appointed from among the leading Scientists in the Dominion, while personnel of Research Committees is drawn from the Industry concerned and from Departmental Officers. All appointments to the staff of the Department's professional, technical and clerical branches are made by the Public Service Commission.

FINANCE. Funds are derived from an annual appropriation from Consolidated Fund of Government. Recoveries are made from Industry, by contributions of Research Associations or by payment for specific work undertaken and from other Departments or Organisations for routine investigations or special research. The various Research Institutes of the Industrial Research Associations and Committees are supported by contributions from the respective Industries, subsidised £ for £ from the Consolidated Fund.

POLICY AND FUNCTIONS. The general policy of the Department is to encourage, organise and co-ordinate scientific research in New Zealand, having particular regard to the needs of both primary and secondary industries. The Dominion wide co-operation necessary between the Department and other Research Organisations is secured through the Research Council. Research covers practically all sections of the primary industries; all aspects of milk, butter and cheese production are under

investigation on behalf of both the individual farmer and the national economy: through the Research Committees active assistance is given to many manufacturing industries.

Grants-in-aid for research are made to the Cawthron Institute, and the University Colleges (including Massey and Canterbury agricultural Colleges) in New Zealand, and to the Imperial Agricultural Bureaux and the Imperial Institute in the United Kingdom. Special statutory grants are made to the Carter Observatory Board and the Royal Society of New Zealand.

Research is encouraged by the provision of National Research Scholarships to be awarded to graduates of the University of New Zealand or other qualified persons, to enable independent research to be carried out.

ACTIVITIES. Work carried out by the Department falls into two main categories: that performed directly for primary and secondary industries and secondly the maintenance of the permanent scientific services of the Government.

The Research Institutes are investigating problems arising in the production of raw material and finished article in the case of the following products: Tobacco; leather; wheat; dairy produce; wool; fruit.

The permanent services undertake routine and specific examinations in addition to fundamental research. The chemical problems of Government Departments and Industry are referred to the Dominion Laboratory, while the Dominion Physical Laboratory and the Auckland Industrial Development Laboratories tackle problems on the physical and industrial engineering side. The Soil Bureau and Geological Survey are operating long term Dominion wide surveys. Under the jurisdiction of the Plant Research Bureau, plant investigations are handled by five bodies dealing separately with the botanical, plant diseases, entomological, grasslands, plant chemistry and agronomy aspects. Work of economic importance on fish liver oils has been carried out by the Fats Research Laboratory. The guidance of the Biometrics Section is available to all branches on the layout and interpretation of statistical experiments.

At present in operation is a twelve months' programme of fundamental research in Radio Meteorology in which Great Britain and the United States are co-operating.

The Department maintains close relations with the two Agricultural Colleges of the University of New Zealand and the Cawthron Institute (which is carrying out mineral deficiency work and fruit research).

Liaison officers overseas are located at London, Washington and Melbourne.

INFORMATION BUREAU. In addition to providing information services for Industry and Research workers, the Bureau is responsible for the Department's publications. These comprise the *New Zealand Journal of Science and Technology*, which publishes accounts of original research in two sections; Agricultural and General, each appearing in alternate months: original accounts of large scale studies are published in the form of bulletins. The *Industrial Bulletin*, published jointly with the Department of Industries and Commerce, contains abstracts of current industrial developments. Soil and geological maps are compiled as the survey work of each district is completed. Full details of all aspects of Departmental research are published in the Annual Reports.

MANUFACTURERS' RESEARCH COMMITTEE WELLINGTON, NEW ZEALAND

Chairman : E. Marsden, C.M.G., C.B.E., M.C., D.Sc., F.R.S., F.R.S.N.Z.
Secretary-Executive Officer : R. T. Wright, M.Com.

BY joint agreement of the Government and the New Zealand Manufacturers' Federation, this Committee, which is advisory to the Hon. Minister of Scientific and Industrial Research and acts as a Committee of the Research Council, was set up in 1944 "to promote research in New Zealand's manufacturing industries", and comprises six nominees of the Manufacturers' Federation and four nominees of the Research Council. The Committee has pursued a three-fold policy: (a) to disseminate information regarding scientific developments locally and overseas, (b) to render assistance in scientific problems of industry (especially the smaller units) where this is not available from any other source, and (c) to foster the establishment of co-operative Research Associations. The Committee has appointed no scientific or technical officers of its own and works through the staff and laboratories of the Department.

Information has been supplied either through the Department's Information Bureau and publications or the *Industrial Bulletin* published conjointly with the Department of Industries and Commerce. Technical assistance to industry has been supplied mainly from Departmental Laboratories, e.g. Dominion Physical Laboratory undertook over 1,000 separate jobs for industry during 1946. For immediate local servicing of industry, Auckland Industrial Development Laboratories were established in 1945, covering engineering and electrical development and design, metallurgy, physics, chemistry and industrial psychology and over 300 industrial projects were undertaken in 1946. An extension of similar facilities in the South Island is contemplated.

RESEARCH ASSOCIATIONS. The Government has approved in principle the formation of Research Associations on the basis of equal contributions from Government and Industry, incorporation also being urged. A Research Association has been formed by the pottery and ceramic industry, another is being formed by the fertiliser manufacturers and approaches have been made to the laundry and allied-trades. Close affiliation with their British and other overseas counterparts will be maintained by all Associations formed locally.

South Africa: Council for Scientific and Industrial Research

Private Bag 189, Pretoria, South Africa. Telephone : Pretoria 3-1261.
President : B. F. J. Schonland, C.B.E., M.A., Ph.D., Hon.D.Sc. (Cape and Cantab.), F.R.S.

THE South African Council for Scientific and Industrial Research was set up in terms of the Scientific Research Council Act, No. 33 of 1945, on 5th October, 1945.

The Council consists of a full time president and nine members. The

president, who is directly appointed by the Government, is also the chief executive officer. The Council is not a Government department but is a corporate body. Its estimates, however, are submitted annually to Parliament by the Prime Minister, who is chairman of a Cabinet Committee appointed to control it. The Council has charge of all matters affecting scientific and industrial research in the Union which may be assigned to it by the Prime Minister or which, with his approval, it may promote. It has also the duty of advising the Prime Minister on scientific and technological matters.

The following national laboratories have been established by the Council under its direct control: the National Physical Laboratory, National Chemical Research Laboratory, National Building Research Institute, National Bureau for Personnel Research, Telecommunications Research Laboratory. Most of these are housed in Pretoria.

It is, however, the Council's policy to decentralise its activities as much as possible. Accordingly the Telecommunications Research Laboratory has been established in the Department of Electrical Engineering of the University of the Witwatersrand. In addition two decentralised units have been established under the National Chemical Research Laboratory, one dealing with oils, fats and waxes in the Department of Chemistry of the University of Cape Town and another dealing with biochemical problems involved in the nutrition of Africans, at the South African Institution for Medical Research. In each case these small units have been established with the agreement of the institutions involved, and suitable arrangements have been made for their operation.

An important development under the Council has been the establishment of a Library and Information Division, with Scientific Liaison Offices in London and Washington. Through this means, in addition to providing normal library facilities for its own staff, the Council aims to provide all scientific and technical workers in Southern Africa with a ready means of access to the literature and information which is available in South Africa and overseas. A heavily annotated list of accessions is issued monthly in the form of a bulletin, which is distributed as widely as possible in Southern Africa. Over 150 accessions are listed each month.

As it is a corporate body the Council can receive and administer funds either in the form of donations for the support of research in specific fields, or in the form of fees paid for investigations undertaken for Industry. Thus a fee is charged for inquiries handled by the Library and Information Division if they require special investigations. Special investigations which are considered to be in the national interest are undertaken by the Council's laboratories on a contract basis for individual manufacturers or groups of industries.

To encourage research at the universities, the Council has established senior bursaries, bursaries, research assistantships and grants which are available to post-graduate research workers. Although these are not restricted to universities, the Council prefers applications to be sponsored by universities or similar institutions. In collaboration with the universities a scheme has been evolved whereby each university and university college annually submits an application for a block grant for post-graduate research, supported by the individual applications for bursaries, assistantships and grants. In each case the total amount approved by the Council, after

careful consideration of the individual applications, is paid to the university as a block grant which is administered by the university.

In addition to assisting individual industrialists in research matters the Council has actively pursued a policy of developing industrial research associations as autonomous bodies in the various branches of industry for the prosecution of research on problems which are common to the industrial group as a whole. These research associations are controlled by the industries themselves, but receive financial support from the C.S.I.R. on a basis proportionate to the industrial subscriptions.

To qualify for a C.S.I.R. grant the industrial research association must guarantee, for a period of five years, a minimum annual subscription of an amount considered adequate for the effective prosecution of its research programme. The Leather Industries Research Association, Grahamstown, is subsidised under this scheme and negotiations are almost complete for the establishment of a Fishing Industries Research Association at Cape Town and a Paint Industries Research Association at Durban.

The Council has formed representative committees to advise it and report on the requirements for the development of research in the fields of medical research, air personnel research and aeronautical research. On the recommendation of the Medical Research Committee and with the approval of the Government, the Council is initiating support for medical, nutritional and dental research by making available research bursaries, assistantships and grants for research at institutions where adequate facilities already exist for the prosecution of such research.

Southern Rhodesia : Industrial Development Commission

Salisbury, Southern Rhodesia

Chairman : L. Musgrave, O.B.E., M.Inst.M.M.

WITH the establishment of the Industrial Development Commission at the end of 1944 Southern Rhodesia, anxious to maintain the great expansion which the war years had given to local industry, took practical steps to co-ordinate industry, investigate the establishment, development and improvement of new industries, and to ensure their efficient conduct.

Furthering the balanced industrial development of the Colony, the Commission will advise on the siting of industries, the economic policy to be followed (including the questions of subsidies, protective tariffs, import and export quotas), and the marketing and transportation of industrial products.

In promoting or helping to finance industries the Commission will pay particular attention to their expansion, better organisation and modernisation. Sound business principles will be the keystone of the scheme for meeting the economic requirements of Southern Rhodesia.

Although the Commission will guide and help in the establishment of new industries, it is not intended that it shall provide an unduly large part of the capital needed to develop private enterprise. The Treasury will advance money for working capital and loans, but the Minister will be able to direct how certain moneys shall be used.

The Commission has powers to acquire an interest in any industrial undertaking, but the approval of the Minister has to be obtained before the Commission can promote a company. In the latter case the shares of such a company will be offered for public subscription.

It is intended that from time to time Parliament will vote money for research into industrial processes.

Research Organisations

DEPARTMENT OF AGRICULTURE

The Division of Entomology carries out research and investigation into the biology and control of insect pests affecting agricultural crops, stored products and livestock, with special attention to the control and eradication of tsetse fly.

The Chief Pasture Research Officer controls the following two research stations, the Central Veld and Pasture Research Station, Rhodes Matopos Estate, Private Bag 19K, Bulawayo, and the Grassland Research Station at Marandellas.

The Senior Plant Pathologist has no research organisation as such under his control but his Department carries out a good deal of individual research. He reports as follows :

“Botanical work has been expanded greatly in the past two or three years and we are approaching the stage when a botanical survey can be commenced. Most of this work is breaking new ground and in this sense must be regarded as fundamental research.

“Much research has been done on plant diseases in Rhodesia and the Plant Pathology Branch is organised for investigating problems of importance. Most of the work is *ad hoc*, there being insufficient staff to tackle fundamental problems. We have in the past collaborated with the University of Pretoria on maize diseases and are at present engaged on co-operative field spraying trials on tobacco with Messrs. Pest Control (C.A.) Ltd.

“During the war years we demonstrated that seed potatoes could be grown and maintained in the Colony, but the future of this work is uncertain.

“Research on seed-borne diseases has been carried on intermittently for years, but now the development of a seed testing laboratory has been approved and more intensified research will be commenced during 1947.”

The Chief Tobacco Officer controls three tobacco research stations as follows :

Tobacco Research Station at Trelawney.

Tobacco Experiment Station at Koroi (near Miami).

Turkish Tobacco and Plant Breeding Station at Umgusa, near Bulawayo.

During the 1947-48 financial year it is proposed to establish a central tobacco research station on the Great “B” Estate near Mazoe and also experiment stations at Chipinga, near the Colony’s Eastern border, and at Inyazura.

The programme of research embraces agronomy, plant breeding, curing and furnace construction.

The Chief Chemist, Department of Agriculture, and the Dehydration Officer are carrying out research into the dehydration of fruit and vegetables.

The Director of Irrigation has instituted research into soil conservation but this is still in its infancy.

The Agricultural Experiment Station, situated in Salisbury, comprises 74 acres (including buildings) and is sited on red dolerite soil, which is classed as clay loam.

On this station most of the research into crop-production and crop rotation problems (excluding tobacco and cotton) are carried out. The breeding and selection of new varieties of crops is an important part of the work, as is the introduction and trial of new crops, varieties and strains from countries throughout the world. Initial work on the practicability of the production of hybrid maize has also been done and will be continued.

In conjunction with other branches of the Department, research into certain soil problems has been carried out, as well as the control of insect pests and crop diseases. The station also investigates problems on the maintenance of soil fertility.

GEOLOGICAL SURVEY

The Geological Survey of Southern Rhodesia has two principal functions : (1) Research on the origin, nature, inter-relation, age, location and other characters of the rocks of the Colony particularly on the relation that they bear to the mineral industries ; (2) the application of the information gained, for the benefit of individual properties.

The staff as enlarged in 1946 comprises the following numbers : Director ; one senior and nine other geologists ; one chemist ; one mineralogist who is also in charge of the collections ; one librarian ; one record clerk and typist. The full cadre of geologists is not yet complete, but it is the Director's intention that in 1947 five geologists shall be engaged continuously on mapping and research, essentially the petrological study of the rocks and the mineral deposits in the area in which they are working. The remaining five geologists will devote their time to assisting mining and other industrial enterprise and to the intensive study of mineral deposits in so far as their time allows.

The Chemist makes full analyses of rocks, ores and minerals and also does assays of metals and base minerals with the exception of gold ores. The Mineralogist determines rocks and minerals sent to the office.

The work of these sub-departments will include spectrographic determinations when the large spectrograph now on order for delivery in August 1947 is in operation.

United Nations Educational, Scientific and Cultural Organisation (UNESCO)

Secretariat : Avenue Kleber, Paris

Director-General : Julian S. Huxley, D.Sc., F.R.S.

SUB-COMMISSION ON NATURAL SCIENCES

AT the General Conference of UNESCO held in 1946, a digest of directives was issued to the Secretariat, giving the lines of work for 1947, as amended by the Sub-Commission on Natural Sciences.

The programme includes measures to provide scientific and technological apparatus and equipment to the devastated areas ; and the establishment of the first four (in China, India, Middle East and Latin America) of a series of Field Science Co-operation Offices to be set up with a view to raising the standard of life of non-industrialised peoples.

The Secretariat is instructed to assist the work of the International Council of Scientific Unions and the specialised unions which it federates, and to stimulate the setting up of International Advisory Councils in the Engineering, Medical and Agricultural Sciences.

The directives include suggestions for the improvement of the present situation in scientific literature : By ameliorating the present serious position in the movement of books and periodicals ; by preparing for a world congress to consider rationalisation of scientific publishing and abstracting ; by stimulating the photolithographic reproduction of back runs of the most important scientific periodicals ; by assisting existing scientific microfilm and photostat services ; and by taking measures to establish uniform scientific terminology in all countries speaking the same or allied languages.

All possible assistance is to be given to scientific work of international significance by grants-in-aid directly or through the relevant international scientific union, and by sending scientific and technical assistance by means of personnel on missions to national institutions. The dissemination of essential research equipment and material exchanges is to be facilitated, notably by operating a Scientific Apparatus Information Bureau, and by taking measures to overcome difficulties arising out of currency restrictions.

The Secretariat is further instructed to assist (in conjunction with other sections of UNESCO), the development and circulation of scientific cinema films, for research, teaching and popularisation purposes ; to assist the travel of scientists across national boundaries ; and to explore the possibilities of the foundation of new international scientific laboratories and observatories. Initial measures are to be taken to compile a world register of scientific institutions and scientists, and to collect up-to-date information on the activities of individual nations regarding the sending and reception of scientific personnel. The Secretariat is instructed to take responsibility (in conjunction with other Sections of UNESCO) for the completion of the UNRRA Fellowship programme (if this devolves upon UNESCO), to administer any Fellowships which may be given to UNESCO by special benefactions, and to institute a certain number of Fellowships.

In carrying out the directives the Secretariat will co-operate with, and advise when required, all the other elements in the United Nations structure and will aid the work of the smaller, more specialised international organisations. It will also do everything possible to inform the public of all countries on new scientific discoveries and their bearing on international and social relations ; to give all feasible aid to science museums ; and to consider the preparation of travelling science exhibitions, and the formation of travel panels of lecturers.

Statements from Private Organisations

THE following statements deal mainly with research and development activities. Information regarding libraries, information services, publications and films will be found in the Section *Books, Periodicals and Films*. Educational training schemes and details of qualifications are included in *Careers in Industrial Research*.

RESEARCH ASSOCIATIONS UNDER THE AEGIS OF THE D.S.I.R.

British Baking Industries Research Association

Wellington House, 125-130, Strand, London, W.C.2. Tel.: Temple Bar 2686.

Chairman : Dr. R. T. Colgate, F.R.I.C.

Director of Research: J. M. B. Coppock, F.R.I.C.

THE Association was registered on 13th June, 1946. It has the full support of the Department of Scientific and Industrial Research. The first Council, which is representative of all sections of the Industry, is composed of Dr. R. T. Colgate, F.R.I.C., Reading (Chairman); G. Russell Austin, Bellshill; D. L. Baine, Belfast; J. H. Beale, M.B.E., London; F. K. Birkett, B.Sc., Stockport; A. Bostock, Manchester; R. N. Cannon, M.A.(Cantab), London; S. H. Elkes, M.B.E., J.P., Uttoxeter; G. Franklin, Cardiff; Wilfrid Hughes, Birmingham; Dr. H. D. Kay, C.B.E., D.Sc., F.R.S., Shinfield; J. R. MacLeod, B.Com.C.A., Glasgow; E. F. Mitchell, Worthing; and H. J. Penny, Hove.

The Council is endeavouring to appoint a Director of Research at the earliest possible date. After this appointment is made detailed plans for the future will be worked out.

In general it may be stated that research into all types of bakery problems will be undertaken to ensure the best use of raw materials available, the standardisation of raw materials, and the production of the best quality goods for the public. The Secretary, pro tem., is L. F. Cadwallader.

British Boot, Shoe and Allied Trades Research Association

Satra House, Rockingham Road, Kettering, Northants. Tel : Kettering 3528.

Chairman of Council : Alan Timpson

Director of Research : H. Bradley, D.I.C., A.R.C.Sc., B.Sc., F.B.S.I.

THE business of the Association is managed by an elected Council, which has outlined a scheme for a post-war research policy.

It is urged that the shoe industry should align itself with a policy of increased scientific industrial research, and that all sections of the industry should take a share of responsibility for its pursuit.

This scheme would, it is estimated, cost £40,000 a year, of which contributions from the Department of Scientific and Industrial Research would

account for approximately two-fifths. The Research Council considers that the most desirable method of raising the rest is a compulsory levy applied by law to all sections of the industry. It is thought that, for the shoe manufacturing section of the industry, a levy on wages paid affords the best method of equitable assessment.

It is proposed that the Council should delegate part of its work to committees covering research, finance, buildings and equipment, and staff. Sub-committees would be established to cover the various aspects of research, each in close touch with the appropriate section of the industry. Close liaison and lively practical interest would be encouraged.

The proposed research programme includes: Compilation of foot statistics and application of the results to the retail trade; methods of measuring and recording feet; last design; materials; shoe manufacture and systems of shoe factory castings (including factory layout and work planning); the better stocking of retail stores, with a higher probability of shoe-fitting service; new methods of stock checking and maintenance; better methods of identification of feet and their needs; market research; physiological effects of certain types of shoes; and shoe repair. The provision of a library and information bureau would be an essential part of the service, and would include a systematic survey of all available literature and experimental trials of possible patents.

The Secretary is H. Bradley, D.I.C., A.R.C.Sc., B.Sc., F.B.S.I.

British Cast Iron Research Association

Alvechurch, Birmingham.

Telephone : Redditch 716.

President : Dr. Harold Hartley

Director : J. G. Pearce, M.Sc., F.Inst.P., M.I.Mech.E., M.I.E.E., F.I.M.

THE British Cast Iron Research Association has now been operating for 25 years. During the war a great deal of special work was undertaken for Government departments, but all work connected with these war requirements has now been completed and the research effort is now entirely devoted to a long-term programme on fundamental aspects, and to relatively short-term work, for the benefit of the industry the Association serves. Considerable additions to both staff and equipment have been made during the last year.

The registered office and laboratories of the Association are located at Alvechurch, Birmingham, on a site which comprises 15 acres of land, admirably suited for future building expansion and capable of providing accommodation for further increase in staff. The present buildings include a well-equipped experimental foundry and machine shop, metallurgical, microscopic, physical, mechanical, chemical and spectrochemical laboratories, and sand testing laboratories, containing some of the latest testing equipment, together with special sections devoted to the study of solid inclusions and gases, and the testing of creep and fatigue. The Scottish Laboratory is situated at Meek's Road, Falkirk (Falkirk 332). The offices and laboratories are open daily and at the service of members, except for brief periods recognised as public or national holidays.

In the past nine years some 112 confidential research reports have been

issued to members. Twenty-eight reports embodying advances in knowledge were presented by the staff to scientific institutions in addition to 18 papers of an educational or descriptive character. The Association has also continued to take an active part in the work of standardisation and specification, particularly through the British Standards Institution.

At the Silver Jubilee celebrations in December 1946 the President was able to announce a significant development in the metallurgy of cast iron, a result of the Association's long-term research work on graphite formation. It is now possible to cast an ordinary hematite pig iron, suitably treated, so that it has a graphite structure of nodular form and mechanical properties resembling those of previous high-duty irons. At the same time it has a small measurable elongation and remains readily machinable. Further work is progressing and arrangements are in hand to make field tests in the works of some members.

RESEARCH DEPARTMENT—*Manager* : H. MORROGH

The Research Department carries out the programme of work approved by the Research Committee, assisted by sub-committees—engineering castings, light castings, white and chilled castings, and malleable castings—and supplemented by two other sub-committees for fuels and furnaces, and sands and refractories, thus covering every branch of the industry. These sub-committees have now all presented their proposals for the future research programme.

While the principal function of the Department is the advancement of fundamental knowledge upon which the industry is based, its second and highly important activity is the carrying out of work of experimental investigation towards clearly defined objectives required by the industry or which becomes necessary as a result of, or as incidental to, fundamental investigation.

DEVELOPMENT DEPARTMENT—*Manager* : H. T. ANGUS, *Ph.D.*

The Development Department deals with inquiries and problems from members, and is being strengthened to inaugurate new developments in iron-founding ; to deal with the application in members' own works of discoveries made in the laboratories and elsewhere ; and to permit periodic visits to members' foundries, whether requested in connection with a specific inquiry or not.

The staff is being strengthened to include a group of specialists to cover the whole field of melting practice, moulding sands, gating and running, metallurgical control, finishing processes, etc.

ENGINEERING USES DIVISION. This Division was formed in 1944 and aims at providing services for engineering foundries and users similar to those rendered to the light castings industry and building users by the Building Uses Department. It covers casting design ; service failures due to design ; data for engineering design of castings ; the extended uses of cast iron ; and the question of competitive materials such as fabricated structures, etc. The Division is in charge of W. J. Driscoll, B.Sc.(Eng.), A.M.I.Mech.E.

BUILDING USES DEPARTMENT—*Manager* : D. L. BRIDGWATER, *B.Arch., A.R.I.B.A.*

This Department began to operate in July 1944 with the object of providing advice and information to all connected with the building and light castings industries on the building uses of cast iron.

INTELLIGENCE DEPARTMENT.

The Intelligence Department includes the Library and Information Bureau. It is responsible for the supervision of publications. The Association now publishes six times annually the *Bulletin* and the confidential *Journal of Research and Development*.

The Council considers there is ample reason for the conduct of a vigorous research and development programme in the ironfounding industry based on a suitable staff properly housed and equipped. They view with optimism the possibility of raising the industry to a new technical plane for the purpose of serving both the home and the export market. They consider the Association must be a strong and impartial body charged with the duty of being the unquestioned leader in the industry on scientific and technical matters, and able to speak as the accepted authority. It must guide the industry in meeting competition with other materials and processes, and in the quest for new applications for castings.

British Coal Utilisation Research Association (B.C.U.R.A.)

13, Grosvenor Gardens, London, S.W.1.

Telephone : Victoria 1534.

President : Sir Charles Ellis, F.R.S.

Director : D. T. A. Townsend, D.Sc., Ph.D.

THE British Coal Utilisation Research Association was formed in the spring of 1938 with the object of conducting research into the utilisation of solid fuel and improving the efficiency with which coal is used.

Before the staff was thoroughly established at the original Experimental Station at Fulham the second European war broke out, and the programme of work was completely revised to meet war needs. Of primary importance in the early war years was the work on transport gas producers, and the filtration of producer-gas for use in internal combustion engines. Other work during the war years was mainly of an *ad hoc* nature directed towards economy in the use of fuel. Work was carried out for the Fuel Efficiency Committee of the Ministry of Fuel and Power, and the Association collaborated with the iron-founding industry in the design of a small heating stove for air-raid shelters. Between 1938 and 1946 the staff grew from 40 to almost 300, and the amount of research and development work undertaken increased in proportion.

The Association is divided for administrative purposes into four parts, of which the Technical Research Division is responsible for fundamental research of an exploratory character into the physical and chemical constitution of coal and its behaviour under various conditions, as well as for objective work which is designed to solve particular problems or assist applied research carried out in the other departments.

One of the more important practical investigations has been carried out by the Domestic Fuels and Appliances Department with the collaboration of the appliance manufacturers, coal producers and coal distributors, and is concerned with the improvement of solid-fuel burning appliances for use in

the home. An open fire has been developed which is not only more efficient than existing conventional types, but also reduces smoke emission, burns continuously and provides for ash removal at weekly or bi-weekly intervals. Greatly improved multi-duty appliances which combine cooking, water-heating and room-warming have also been evolved, and attention has been paid to heating systems suitable for permanent houses.

Of special interest to industry is the work of the Steam Engineering Department, which undertakes both fundamental and practical investigations into problems connected with Shell-type boilers and the mitigation of troubles caused by external deposits and corrosion in water-tube boilers.

Liaison with industry and the study of industrial problems is the responsibility of the Development Division, which also carries out engineering work on furnaces embodying a novel system of combustion which was discovered by the Association in 1941-1942. Among other work of this Division is an investigation into gas producers for furnace firing, which is being made with the co-operation of the British Iron and Steel Research Association.

The Association is at present erecting buildings at Leatherhead, where the work now undertaken at six separate premises will be continued and expanded. It is hoped that the greater part of the staff will be housed in the new buildings by the autumn of 1947. Inquiries should be addressed to the Development Officer, R. Colville-Wallis, M.A.

British Coke Research Association

11-12, Pall Mall, London, S.W.1.

Telephone : Abbey 6772.

Chairman : Ralph Alsop, C.B.E.

Technical Officer : G. W. Lee, M.Sc., F.Inst.F.

THE British Coke Research Association was incorporated under the Companies Act on 20th June, 1944, and is a Research Association qualifying for grant aid under the Department of Scientific and Industrial Research.

The work of the Association is in the hands of a Council of 17 representative members drawn from the coking industry, who have appointed a Research Committee as a principal advisory body. This Research Committee has remitted certain portions of its programme of research to panels of academic research workers and industrial fuel technologists. In this way, the Association is drawing upon the knowledge and experience of men within the industry in order to facilitate the programme involved.

The Association undertakes the research work of the coking industry, and is co-ordinating, developing and extending the work begun by three Regional Committees which have been established for some years at Sheffield, Newcastle and Glasgow.

MIDLAND COKE RESEARCH COMMITTEE. This Committee has recently been dissolved and the Midland Coke Research Station is now being established at Lynwood, Clarkehouse Road, Sheffield. The laboratories are at present housed in the University of Sheffield but the work is being transferred to the new premises as soon as the work of conversion is completed. The Superintendent of the Midland Coke Research Station is Dr. R. A. Mott, D.Sc., F.R.I.C., F.Inst.F.

NORTHERN COKE RESEARCH COMMITTEE. Under the direction of Professor H. L. Riley, D.Sc., A.R.C.S., F.R.I.C., the staff of this Committee forms part of the organisation of King's College, Newcastle, in the University of Durham.

SCOTTISH COKE RESEARCH COMMITTEE. The activities of the Scottish Coke Research Committee have been in abeyance during the war years but work is now being developed and staff expanded under the direction of Professor R. Hay, Ph.D., F.R.I.C., at the Royal Technical College, Glasgow.

The work of the Panels has steadily increased since the inception of the Association and several reports have been issued on various aspects of investigations dealing with the problems before the coking industry. These reports deal with such subjects as blending of coals for carbonisation, standardisation of testing and analysis within the industry, practical coking plant problems and improvement of working conditions.

The regional laboratories are co-operating in the expanding activities of the Panels in addition to developing experimental work on special subjects. The Midland Station is concerned with testing and analysis of coke, and with problems of sizing and use of coke in domestic appliances in addition to other programmes. The Northern Committee is continuing research work on the fundamental nature of coal and coke, by detailed study of *x*-ray diffraction-broadening, which occurs in the powder photographs of coals, cokes and chars. Investigation of porosity and combustibility of coke with particular reference to blast furnace utilisation is being carried out in the Scottish laboratories. Inquiries should be sent to the Secretary, F. Greenwell.

British Cotton Industry Research Association

Shirley Institute, Didsbury, Manchester.

Telephone : Didsbury 2401.

Chairman : Sir Harold Parkinson, O.B.E.

Director of Research : F. C. Toy, D.Sc.Lond., F.Inst.F.

IN 1916 an inquiry by the Department of Scientific and Industrial Research as to the necessity or desirability of encouraging research in connection with the cotton industry, led to the formation of the British Cotton Industry Research Association in 1919.

The main object of the Association is the promotion of scientific and technical research in connection with cotton and its utilisation in industry. In 1929 and 1936 the work was extended to include rayon and silk respectively. Research is undertaken at the Shirley Institute, Didsbury, which is also the headquarters of the Association. Research is conducted into problems of the British cotton, rayon and silk industries, and in addition problems of individual members are investigated, although it is not the function of the institute to undertake pure routine testing.

British companies engaged in the production of goods made from cotton, silk and any synthetic fibre and in the production of textile machinery, are eligible for membership. At least three-quarters of the governing bodies of such companies must be British subjects and a similar proportion of their capital must be British. Election for membership is at the discretion of the Council and subscriptions, particulars of which are obtainable from the Secretary, are fixed on a capital basis.

Special services are available to all full members. These include special investigations where any particular difficulty is discussed with the research staff and the preparation, free of charge, of a confidential report. A liaison department is in operation, staffed by men with mill experience, who keep in touch with managers and technical men in all member firms.

Confidential pamphlets and memoirs are produced for the exclusive use of member firms. A large amount of research work of a fundamental, scientific character is also carried out and is published openly in the scientific press.

At the outbreak of hostilities, the facilities of the Association were placed, without charge, at the disposal of Government departments requiring assistance.

The present staff numbers over 430, about a fifth of whom are university graduates.

The Association has under consideration ambitious plans for progressive development and expansion and with these ends in view the Council approached the D.S.I.R. with a request for revised conditions of grant. As a result, in August 1945, the last year of the existing grant was cancelled and new conditions provide for a minimum grant of £30,000 a year for five years, on terms which in the event of an industrial income of £120,000 make possible an annual grant of £80,000.

A considerable extension of the Liaison Department is proposed and new personnel will include men experienced in the finishing section of the industry. The Institute aims at a constant two-way traffic of this personnel between the Department and the industry.

The development of fundamental research to the point of actual application to the industry has long been a part of the Institute's programme and a new and improved engineering workshop is being created to aid in a better assessment of new ideas before Lancashire embarks on any programme of wholesale machinery replacement. Final assessment of the value of new machinery will depend upon experimental mill trials such as those initiated through the action of the Board of Trade in placing at the disposal of the spinning section of the industry the surplus money resulting from the Spindles Board Levy.

Additions are contemplated to the range of dyeing and finishing machinery already installed at the Institute. The equipment is to be better housed and the present technical scale work increased. Closely connected with this is the proposed formation of a chemical engineering department to deal with fundamental research into the principles underlying various finishing processes and to be a centre for technical inquiries.

Research on cotton, silk, rayon and other synthetic materials will be expanded at the Institute. Much of the Institute's equipment and resources are equally suitable for work on fibres other than cotton. They will be available for research on as many fibres as are of interest and value to members.

Building extensions commensurate with the enlarged programme are envisaged and the Institute has ample space for the purpose. Already a canteen extension to seat 400 is being constructed and a new workshop for instrument-making and glass-blowing is being built close to the existing workshop.

British Electrical and Allied Industries Research Association (E.R.A.)

15, Savoy Street, London, W.C.2.

Telephone : Temple Bar 7907.

President : The Right Hon. The Earl of Mount Edgcumbe, M.I.C.E., M.I.E.E.

Director of Research : Stanley Whitehead, M.A.(Oxon.), Ph.D.(Lond.),
M.I.E.E., F.Inst.P.

USUALLY known as the E.R.A., this Association is one of the largest of the co-operative industrial research associations formed on the Government model and assisted financially through the Department of Scientific and Industrial Research. It is unique in that it has the support, not only of the manufacturers in and connected with the industry, but also of those engaged in electricity supply, the largest users of the manufactured products, and other user interests.

The work is controlled by a Council on which are represented the Institution of Electrical Engineers, the Electricity Commissioners, the Central Electricity Board, authorised undertakers both municipal and company, manufacturers, the D.S.I.R., and others able to give expert assistance.

The Council is assisted by some 22 Sectional Committees, acting in an advisory capacity and representing the numerous fields of interest in which the Association is engaged. These in turn control approximately 67 executive committees responsible for the programmes of researches and for the reports issued and for forming an effective technical liaison with industry. Many independent experts give their assistance.

By co-operation, through the E.R.A., the industry has secured (a) that major problems are pursued on an adequate scale, and (b) liaison with all who can help in any degree. Through the channels it provides, the public and private laboratories and power plants, the universities, technical colleges and individual experts, pool their resources and knowledge, in the general interest.

The E.R.A. serves as the principal medium for co-ordination of research in a very wide field, extending well beyond the electrical industry. Thus, although it is responsible for less than 10 per cent. of the research carried out by and for the industry, its activities beneficially affect a much larger fraction of the whole.

Starting from very modest beginnings, the present annual expenditure exceeds £100,000 and the staff exceeds 200. Both figures would have been considerably larger but for the war. During the war the staff was curtailed and many valuable programmes for the general benefit curtailed or postponed.

In its early years the business of the Association was primarily that of co-ordinating, organising and supervising researches conducted with the help of existing laboratories, both public and private, but in many instances it proved necessary to provide special facilities for new researches where none were available and eventually in 1935 this work was centred at an auxiliary laboratory at Perivale in Middlesex. The saturation of other facilities and pooling of an increasing amount of work led to considerable expansion of work done by the staff and today more than half the work of the Association is conducted by its own staff.

With steady expansion of the industry, still continuing, and growth of the co-operative spirit, it has been found necessary to make provision for larger premises. New offices are at Thorncroft Manor, Leatherhead, and new laboratories have been built at Wadsworth Road, Greenford, Middlesex.

The Association by its Imperial membership provides for exchange of ideas with those concerned in progressive development of the industry in the Colonies and Dominions. It has been used extensively by the industry in preparing the British contributions to international gatherings.

Its work for the electricity supply industry has contributed materially to reductions in the cost of the unit of electricity, cost of electrical plant and running costs, and to increased reliability and safety. The individual user is able through the Association to make known his needs.

Its work for manufacturers, besides solving difficult scientific and technical problems, has assisted in the production, selection and specification of most of the materials used. Many researches have been carried to a successful issue which required larger facilities and a wider liaison than any individual manufacturers could secure. The Association maintains an Information Bureau and a Library, and publishes reports.

The application of the scientific method under competent supervision and on an adequate scale, no doubt accounts for the highly profitable character of most of the work done. It is generally difficult to trace the financial return from a particular research; advances in technology do not appear as recognisable items in audited accounts. Nevertheless in several instances admitting of estimate, single groups of researches have been shown to produce returns exceeding the total expenditure of the E.R.A. on all its activities and in a few instances the annual gain can be expressed only in six and seven figures. The Secretary is R. A. McMahon, M.I.E.E.

British Food Manufacturing Industries Research Association

57, Catherine Place, London, S.W.1.

Tel. : Victoria 4317.

Laboratories : 2 & 4 Dalmeny Avenue, London, N.7. Tel. : North 1048.

Chairman of the Council : J. G. Mathieson

Director of Research : L. E. Campbell, Ph.D., F.R.I.C.

THIS industrial Research Association has been formed by the amalgamation of the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades and the British Food Manufacturers Research Association. The former was founded in 1919 and the latter in 1925. The amalgamation dates from 1st January, 1947.

The income of the Association is provided by subscriptions from member firms, supplemented by a grant from the Department of Scientific and Industrial Research.

The staff consists of 25 graduates and 10 non-graduates. The Association's offices are controlled by a Council whose members are nominated by manufacturers and by various Government departments. The Director of Research and the senior members of the staff have meetings periodically with panels of chemists and technical representatives nominated

by the trade for the purpose. Close contact is maintained with the Food Investigation Board of the D.S.I.R. on all matters of research, and staffs are encouraged to collaborate.

Reports on research, technical papers and abstracts are circulated privately to member firms and Government departments. Papers on scientific subjects connected with the research work are contributed by members of the staff to scientific periodicals.

The work of the two older Associations was confined in the main to cocoa, chocolate, sugar-confectionery, jam, processed meat and fish, bacon and ham, sausages, etc., and pickles and sauces. Nearly 200 reports on these subjects have been issued. The scope of the new Association will, it is hoped, be extended considerably. This refers not only to the range of commodities covered but also to the ground of research in the case of each commodity. For instance there are now links between the Association and the agricultural research institutions dealing with the production of the raw materials. This liaison will prove of fundamental importance.

Manufacturers of processed foods are invited to form research groups within the Association. This does not refer to the Flour Milling and Bakery Industries, which have their own Research Associations.

New laboratories are to be built at Leatherhead. The cost of building and equipping these is estimated to be £100,000 and a fund to raise the necessary proportion from industry has already been opened. The land has been purchased. The acting Secretary is T. A. H. Sycamore.

British Internal Combustion Engine Research Association

111-112, Buckingham Avenue, Slough, Bucks. Telephone : Slough 20295.
 President : The Rt. Hon. The Viscount Falmouth, B.A., C.I.E.E., M.I.Mech.E.
 Director of Research : Engineer Rear-Admiral D. J. Hoare (Retd.), C.B., M.I.Mech.E.

THE British Internal Combustion Engine Research Association, which is recognised by the Department of Scientific and Industrial Research, is now developing its laboratory at Slough.

In addition to experimental work on test engines, with the object of establishing methods of improving performance and durability, investigations are being conducted on bearing performance, noise, bending fatigue of crankshafts and torsional vibration.

Use is made in the laboratory of the latest developments in electronic techniques; and in many instances novel apparatus has been devised.

Representatives of the Association have visited Germany to study German developments in engine design and research, and members of the Association have had the opportunity of examining, at the laboratory, examples of foreign engines, some of which have been tested in or for the laboratory.

Specialist Panels, appointed by the Research Committee, survey developments in gas turbines, pressure charging and torsional vibrations and advise the Committee as to appropriate courses of action.

British Iron and Steel Research Association

11, Park Lane, London, W.1.

Telephone : Grosvenor 4751.

Chairman of the Council : A. McCance, D.Sc., F.R.S.

Director of Research : Sir Charles Goodeve, O.B.E., D.Sc., F.R.S.

THE British Iron and Steel Research Association was formed in June 1944, to take over and extend the work which had hitherto been carried out by the Iron and Steel Industrial Research Council, which was a department of the British Iron and Steel Federation, and by the Joint Research Committees of the Iron and Steel Institute. The Association serves the iron and steel industry as a whole and qualifies for grant from the Department of Scientific and Industrial Research in the same way as other Research Associations.

The work of the Association is organised under the general direction of its Council into a number of Divisions corresponding to the various aspects of iron and steel production : *i.e.* Iron Making, Steel Making, Mechanical Working of Iron and Steel, Steel Castings, Plant Engineering, Metallurgy ; as well as having departments of physics and chemistry whose functions are to watch progress in these two sciences and consider how they can be applied to the iron and steel industry. Research is being carried out into problems connected with the industry, from raw materials to finished products. Attention is paid not only to productive processes but also to such things as ore treatment, efficient and economical use of fuel, plant design and construction, instrumentation, problems connected with the rolling, casting and other processes of working iron and steel, etc. as well as general metallurgical matters.

In order that the work of the Association shall be carried out as efficiently and as thoroughly as possible, the fullest possible use is made of the practical men and the scientific workers connected with the industry. Close contact is maintained with the research laboratories of the industry, the Iron and Steel Institute and universities and technical colleges throughout the country, as well as with research associations having kindred interests. For this reason also membership of the Association is open not only to the producers of iron and steel but also to the users, plant manufacturers, and suppliers of raw materials, to ensure that the work of the Association covers the widest possible field of interest to the industry as a whole.

Inquiries should be sent to the Secretary, H. A. Bridges.

British Jute Trade Research Association

1, Bank Street, Dundee.

Telephone : Dundee 5085.

Director of Research : H. Corteen, M.Sc., F.Inst.P.

THE British Jute Trade Research Association was formed by the British Jute Trade in 1946, under the auspices of the D.S.I.R. to carry out fundamental and applied research on all problems appertaining to the British Jute Industry.

Following the appointment of the Director of Research, the Association is at present engaged on completing the initial organisation, and a detailed research programme will then be inaugurated.

The Research Laboratories will be situated in Dundee, Scotland, which is the centre of the British Jute Trade.

British Launderers Research Association

The Laboratories, Hill View Gardens, London, N.W.4. Tel. : Hendon 6111.

Chairman : R. J. Brereton

*Director of Research : F. Courtney Harwood, B.Sc., F.R.I.C., M.I.Chem.E.,
F.T.I., F.R.S.A.*

THE British Launderers Research Association was founded in 1920 for the promotion of research and other scientific work in connection with the laundry and cleaning trades. Membership is open to duly authorised representatives of firms engaged in laundering or cleaning ; school, hospital and institution laundries ; and firms which manufacture, process, or supply textiles or laundry materials and machinery.

The Association operates under the aegis of the Department of Scientific and Industrial Research and its activities are controlled by a Council elected from among its own members and including representatives nominated by the D.S.I.R. It is supported by the subscriptions of members and the D.S.I.R. makes a grant, dependent on the total subscription income.

The premises of the Association are at Hendon and include a block of laboratories and an experimental laundry. This accommodation has been inadequate for some time and new premises are about to be built on an adjoining site of approximately one acre.

The Director of Research controls a research staff of chemists, physicists, engineers and a bacteriologist, as well as qualified analysts, textile technologists and librarians. Experienced technical officers visit laundries belonging to members in all parts of the country. Their chief function is to advise members who may be in any difficulty, to correct process faults or to introduce new processes, and to give information about all new developments.

The laundry industry differs from most others in being composed of many widely scattered units, few of which, if any, are large enough to employ qualified scientists. Hence there is great need for technical guidance in a form which can be readily appreciated and applied by people with only a limited technical training. The work of the technical officers is specially valuable in this connection and their number is being increased as suitable graduates become available.

Fundamental research is one of the Association's most important activities and it must always be accompanied by applied research so that processes may be developed through the laboratory and semi-scale stages to full commercial use. The Association maintains a careful balance between fundamental and development work.

The B.L.R.A. 1946 washing process enables considerable savings in soap, water and time to be made in comparison with the standard process of ten years ago and produces work of at least equal quality. The process is in fairly wide use and will undoubtedly find more and more application even when all the restrictions on soap have been removed.

In addition to the work of the research, analytical and advisory departments, training courses are held for students and laundry workers. Two courses in laundry work have been approved by the Ministry of Labour and National Service under the Further Education and Training Scheme, and the maximum number of ex-Service personnel that can be accommodated

are now taking these courses. Contact is also maintained with many Government departments, the other Research Associations and many other bodies, including engineering and textile organisations.

The launderer has no control over the shrinkage of cotton fabrics ; and felting of wool can only be minimised by most careful handling. The cloth manufacturer or finisher, on the other hand, has processes at his disposal which will enable him to supply "fully shrunk" cotton goods or "shrink resistant" woollens. Certain manufacturers already send samples of their new fabrics to the Association for test before placing them on the market in order to confirm that they reach a satisfactory standard of launderability. It is hoped that in the future much closer co-operation on these lines will be possible, as this will enable more satisfactory service to be given to the customer both by the manufacturer and the launderer.

British Leather Manufacturers Research Association

1-6, Nelson Square, London, S.E.1.

Telephone : Waterloo 4432.

Chairman : H. Morland, M.Sc.

Director of Research : Dr. Henry Phillips

THE British Leather Manufacturers Research Association was formed in 1920 under the auspices of the Department of Scientific and Industrial Research for the purpose of carrying out scientific research and technical investigations on behalf of the leather manufacturing (tanning, currying and finishing) industry.

The Association's income is derived from the subscriptions of member firms and is supplemented by an annual grant from the D.S.I.R. Ordinary Membership is restricted to British leather producers, and Associate Membership is offered to allied trades, for example, manufacturers of leather goods and of materials used in the leather-producing industry.

The Membership roll comprises about 200 leather-producing firms, and 50 Associate Members. Membership has greatly increased during the past few years, which is evidence of the growing recognition by the trade of the value of scientific research.

The Association is controlled by a Council comprising mainly elected representatives of member firms with the addition of co-opted members representing research and teaching institutions associated with the leather industry. The D.S.I.R. is also represented on the Council.

The rapid growth of membership during the war period naturally led to an expansion of the Association's activities and to a need for increased accommodation and staff. Furthermore, the laboratories at Nelson Square suffered very severe bomb damage, which greatly reduced the existing facilities and necessitated a dispersal of part of the staff to other quarters.

The Association is seeking more spacious premises or a suitable site on which to erect new laboratories when building restrictions are relaxed.

The laboratories comprise chemical, biological and physics sections, and a library and information bureau. The Research Association also has a very active liaison department, which maintains close contact with member firms

by means of works visits and district meetings, gives individual attention to members' problems, and acts as the medium for exchange of information and the facilitation of the application of results of laboratory research in the tannery.

British Non-Ferrous Metals Research Association

81-91, Euston Street, London, N.W.1.

Telephone : Euston 3372.

Chairman: Lt.-Col. Sir John Greenly, K.C.M.G., C.B.E., M.A., M.I.Mech.E.

Director : G. L. Bailey, M.Sc., F.I.M.

THE British Non-ferrous Metals Research Association is a national organisation of producers, manufacturers and users of non-ferrous metals from whom it draws its income in the form of annual subscriptions. These are augmented by a substantial grant from the Department of Scientific and Industrial Research, by which the Research Associations were originally sponsored under the Government scheme for industrial research of 1917. Today there are nearly 400 member companies of the Association, which has a total income of about £65,000 per annum. In return for the relatively small subscriptions, members enjoy an exclusive right to the results of the various investigations that are carried out and to certain additional services which the Association provides. The Association is governed by a Council composed of representatives from its members and from certain Government and Service departments. A Research Board surveys and guides the general course of the Association's research work which is carried out under the Director of the Association. The work is at all times capable of being suitably and quickly modified as may be required by the changing needs of industry. Investigations completed and in progress in the Association's laboratories include work on the production of sound castings in non-ferrous metals and alloys; corrosion and its prevention, particularly in marine service and in domestic water systems; welding, soldering, spectrographic and other methods of metallurgical analysis; mechanical properties including fatigue and creep resistance at room and elevated temperatures; and the production of new alloys with improved properties for specific applications. The Association also contributes financially to certain external research work and some of its own work is carried on extra-murally. Investigations on the rolling and deep drawing of metals come within these categories. The results of the Association's research work are made available to all its members and in a few cases are published after a suitable interval in the metallurgical press.

The Association's Liaison Department is concerned with the industrial application of the Association's research results and generally with maintaining liaison with members. In addition, the Department receives each year a large number of requests from members and Government departments for immediate assistance in technical problems arising in the course of their daily work. Each inquiry is treated in strict confidence and, where desirable, visits are made to members' works to discuss the difficulties on the spot. The Association also maintains a library and an Information Department.

British Paper and Board Industry Research Association

*St. Winifred's Laboratories, Welcomes Road, Kenley, Surrey. Telephone :
President : Grenville Beckett Uplands 6401.
Director : Norman R. Hood, Ph.D., B.Sc.(Hons.), F.R.I.C., A.M.I.Mech.E.,
Fel. Univ. L'pool.*

THE decision of the Paper Makers' Association of Great Britain and Ireland to found a Research Association for scientific investigation into all technical branches of paper making, resulted in the incorporation of the British Paper and Board Industry Research Association in February 1945.

The industry, which has a very long record of progress in the United Kingdom since the establishment of the first paper mill in 1490, has devoted much time and attention in the past to research and technical and scientific development.

Research Laboratories are being established in Kenley, Surrey, and at the present time are in process of being equipped and staffed, and it is hoped at a not too distant date to commence on the technical problems as submitted by the industry in connection with research in paper and board and their allied products. The Secretary is W. N. Gordon, A.C.I.S.

British Pottery Research Association

*Queen's Road, Penkhull, Stoke-on-Trent. Telephone : Stoke-on-Trent 48741.
Chairman of Council : Col. Harry Johnson, D.S.O., T.D., J.P., D.L.
Acting Director of Research : A. Dinsdale, M.Sc., F.Inst.P.*

THE Research Association whose Research Station is at Penkhull, Stoke-on-Trent, conducts investigations into raw materials, manufacturing processes and plant, and the quality of the finished product, on behalf of the British pottery industry. Each section of the industry appoints a panel to supervise the research undertaken on its behalf. The following Panels are in being : Earthenware ; Tile ; China ; Jet and Rockingham ; Sanitary Fireclay ; Sanitary Earthenware ; Electrical Porcelain ; Kiln ; Engineering ; and Saggars. There is also a Directors' Consultative Committee, made up of men with scientific qualifications who are engaged in the industry, and Joint Panels for Kiln Test Codes with the British Standards Institution.

The Association is governed by a Council consisting of a Chairman, a Vice-Chairman, and members drawn from the various interests in the industry, together with four representatives of the Department of Scientific and Industrial Research, under whose ægis the Research Association operates.

All the research work of the Association is carried out by its own staff or by arrangements with other bodies having special experience or equipment. The technical reports on the results of research work are issued in the first place confidentially, to members only. They appear as material is available and not at fixed intervals. After a given period papers may be

released for general publication, and a number have already been printed in the *Transactions* of the British Ceramic Society.

Owing to war conditions the Research Association is not at present spending up to the limit of its income but plans are under review for a considerable extension of its premises and activities as soon as circumstances permit. The Research Association recently sent a deputation to the U.S.A. to study technical developments in the American pottery industry.

Inquiries should be sent to the Secretary, Sidney H. Dodd, O.B.E., at Federation House, Station Road, Stoke-on-Trent.

British Rayon Research Association

*Bridgewater House, 58, Whitworth Street, Manchester, 1. Tel.: Central 3777.
Chairman: Sir William Palmer, K.B.E., C.B.*

ONE of the earliest decisions taken by the Council of the British Rayon Federation after its formation in 1943 was that it would promote the establishment of an organisation to conduct collective scientific and technical research on behalf of the rayon industry. This industry is itself essentially the outcome of scientific research, and its future depends on the vigorous prosecution of research; hitherto, however, such work has been largely initiated and carried out (apart from the work done by the British Cotton Industry Research Association) by individual concerns, and there has been little co-operative effort.

With the approval and support of the Department of Scientific and Industrial Research the British Rayon Research Association has now been formed; it was registered on 19th November, 1946, as a company limited by guarantee and without share capital. The primary and immediate aim of the Association is to serve the users of rayon by research—fundamental and otherwise—on rayon and rayon products, with a view to improving their properties and widening their markets. For this purpose it is intended to establish a large-scale Research Institute, but as some time must elapse before such an institute can be built and begin operations, the Association is considering the best means of encouraging research work in the interim period.

The Association, while initiating and ultimately carrying out work concerned solely with rayon, will have prominently in mind the importance of mixture yarns and fabrics, and will work in co-operation with other Research Associations—for example, those concerned with cotton, wool and flax. In order to assist close co-operation of this kind the Association is endeavouring to find a site for building the Research Institute in the North-West region, near to the premises occupied by other textile research organisations.

The first members of the Council of the Association are: Sir William Palmer, K.B.E., C.B. (Chairman); A. D. Carmichael; C. M. Skinner; G. H. Spilman; P. J. Gratwick; G. L. Oliver; A. J. Winkup; M. A. Tatton; R. W. Pennington; F. T. Kirk; James Ewing; N. G. McCulloch; J. Fishwick; W. R. Wadsworth; A. J. C. Walters.

British Refractories Research Association

Mellor Laboratories, Hanley, Stoke-on-Trent. Tel. : Stoke-on-Trent 29641.

Chairman of the Council : Lt.-Col. C. W. Thomas

Director of Research : A. T. Green, O.B.E., F.R.I.C., F.Inst.P.,

Hon.M.Inst.Gas.E.

THE refractories industry of this country was among the first to avail itself of the facilities for research offered, towards the close of the first world war, by the newly formed Department of Scientific and Industrial Research. The B.R.R.A. actually began its work in 1920, with the late Dr. J. W. Mellor as Director of Research. During the following decade the Association became well established and accepted as fundamental to the technical well-being of the industry which it served. By 1934 it had outgrown the capacity of its first home, and the Mellor Laboratories were founded at Shelton, Stoke-on-Trent. Extensions to the original buildings are continually being made.

The field which the Association covers embraces all problems associated with the manufacture, testing and use of refractory materials together with the manufacture of heavy clay products. The results of the research work are circulated confidentially to members in the form of a technical bulletin, issued three or four times a year ; during the past 25 years over 400 papers have been published in this way. However, most of the Association's work is ultimately given wider circulation : the results of investigations carried out for the gas industry are included each year in the *Transactions* of the Institution of Gas Engineers ; work for the iron and steel industry has been published as special reports of the Iron and Steel Institute ; and certain of the remaining papers are reprinted in the *Transactions* of the British Ceramic Society.

In addition to the main research activities of the Association, a Testing Department is maintained to carry out all the testing demanded by the refractories and the heavy clay industries. The Association also maintains an Information Department, and a library.

The B.R.R.A., following the pattern of other research associations, has at its head a Director of Research who is responsible to an elected Council. Assistance in the co-ordination and development of research programmes is given by technical committees. The personnel of these committees is drawn from that branch of the industry immediately concerned, together with the senior members of the research staff responsible for the field of work in question. The operation of technical panels for the gas industry has contributed in no small measure to the smooth and effective working of the programmes of research drawn up for those major users. Work on the efficient use of fuel by the refractories and heavy clay industries has been intensified during recent years through collaboration with the Ministry of Fuel and Power. A brief survey of the work of the Association and its special bearing on the fuel industry appeared in the *Journal* of the Institute of Fuel in February 1944 ; reviews similar in scope but bearing on the metallurgical industries have appeared in the September issues of *Metallurgia* during recent years. Inquiries should be sent to the Director of Research.

British Scientific Instrument Research Association

26, Russell Square, London, W.C.1.

Telephone : Museum 2656.

Chairman : Dr. W. H. Eccles, F.R.S.

Director of Research : A. J. Philpot, C.B.E., M.A., B.Sc., F.Inst.P.

THE British Scientific Instrument Research Association is the oldest existing participant in the research association movement inaugurated by the Government through the Department of Scientific and Industrial Research towards the close of the first world war. B.S.I.R.A. was founded in 1918 by a group of six scientific instrument firms. As inaugurated, it was concerned almost entirely with the problems of the optical instrument industry, but its scope was soon enlarged to cover electrical as well as optical instruments. The first Director of the Association was Sir Herbert Jackson, K.B.E., F.R.S., who had rendered notable service to the country during the first world war by the application of his unique knowledge of glass technology to the production of glass in this country and especially of optical glass. The Association is controlled by a Council under the chairmanship of Dr. W. H. Eccles, F.R.S. The membership of the Council consists mainly of representatives of the member firms, but includes six nominees of the D.S.I.R., from which the Association receives an annual grant.

Membership is open to all British manufacturers of scientific instruments, and the present membership of 100 includes manufacturers of scientific instruments of every type. The laboratories of the Association at Russell Square, which served it well in the days of small membership, have proved inadequate for the wide field of research necessitated by the great variety of instruments which now falls within the purview of the Association. Comprehensive laboratories with very complete facilities have been housed at "Sira", Southill, Elmstead Woods, Chislehurst, Kent, and will be in full working order early in 1947. The work of the Association has been sectionalised and there are now departments dealing specifically with the problems of optical instruments, electrical instruments, electronics, mechanical instruments, physics and chemistry.

Research and development are certain in the future to occupy a much more prominent place in industry in general than they have done in the past. For these activities, scientific instruments of the highest quality will be required from the scientific instrument industry in this country. It is the aim of the B.S.I.R.A. to ensure that these instruments completely meet the needs of users.

British Shipbuilding Research Association

5, Chesterfield Gardens, Curzon Street, London, W.1. Tel. : Grosvenor 8891.

Chairman of Council : Sir G. Tristram Edwards

Director of Research : S. Livingston Smith, D.Sc.(Eng.), F.C.G.I.,

M.Inst.C.E., M.I.Mech.E.

THE British Shipbuilding Research Association was formed in April 1944. The Association's Memorandum and Articles of Association are on model lines approved by the Department of Scientific and Industrial Research.

The governing body of the Association is the Council, which has sole control in regard to all matters relating to the management and organisation of the Association. Directly responsible to the Council is a Research Board on which, in addition to members of the industry, the various scientific interests are represented, including the Admiralty, the Ministry of Transport, the D.S.I.R., the Classification Societies and the Shipowners. The Board operates in the whole field of applied research in compliance with the policy of the Council, and, for the purpose of conducting specific or sectional research, has the power to set up committees and sub-committees consisting of persons with specialised knowledge of particular subjects to be investigated. The Chairman of the Board is Sir Maurice Denny, Bt.

The objects of the Association are: To establish for the industry the foremost place in scientific shipbuilding; to draw upon the vast reservoir of experience acquired in building ships in British yards in the past for the purpose of directing technical progress in the future (in this respect, close collaboration with shipping interests and with marine engine-builders and ship-repairers, particularly in regard to technical analyses of records of service performance of ships, is an important feature); to provide for the industry in ready form an up-to-date and continuous picture of scientific developments in shipbuilding throughout the world; to seek close co-operation with other research associations engaged in furthering scientific advancements in matters of importance to the shipbuilding industry; and to ensure speedy publication of the results of its work in a form suitable for immediate use in shipbuilding. In this work the Association co-operates with other interests such as the National Physical Laboratory, the Admiralty and the universities.

The research activities of the Association are now well under way, and it is hoped that at an early date results will be derived that will assist to produce ships combining the most skilful design in construction with the greatest economy of production. The Secretary is J. C. Asher, B.Sc.(Econ.).

British Welding Research Association

29, Park Crescent, London, W.1.

Telephone : Welbeck 7485.

President : Sir William J. Larke, K.B.E.

Director of Research : A. Ramsay Moon, B.A., B.C.E., M.I.Struct.E.

THE British Welding Research Association which since 1936 has functioned as the Welding Research Council has now been incorporated as a Research Association under the Department of Scientific and Industrial Research.

The expenditure for the past two years has been £14,712 and £29,359 respectively and the anticipated expenditure for the current year is expected to be about £60,000.

The Association is governed by a Council under the Chairmanship of Sir Stanley V. Goodall, K.C.B., O.B.E., and the researches are controlled by a Welding Research Board under the Chairmanship of Professor J. F. Baker and a series of Working Committees. Until now most of the researches have been done by co-operating firms and organisations, or in universities, but arrangements are in hand for equipping metallurgical and engineering laboratories.

The objects and activities of the Association are : To ensure that there shall be continuous progress in the methods and materials used for welding all types of metal and to investigate the production of weldable materials in all metals ; to provide widespread information on the strength and behaviour of welded structural assemblies for all types of engineering structures ; and to provide Codes of Good Practice for the control of the various arc, gas and resistance welding processes.

The results of research are published in the *Transactions* of the Institute of Welding or in a series of printed *Reports* of the Association.

Coil Spring Federation (Springs Research Organisation)

Secretaries : Messrs. Peat, Marwick, Mitchell & Co., 301, Glossop Road, Sheffield, 10. Telephone : Broomhill 63031.

President : L. Barlow-Massicks

Research Consultant : R. Genders, M.B.E., D.Met., F.R.I.C., F.I.M., Green Ridges, The Meadow, Chislehurst, Kent. Telephone : Imperial 3135.

CO-ORDINATED industrial research in springs was first instituted in 1942, accompanying the formation of the Coil Spring Federation, as a war time measure to unify the industry for the purpose of meeting the large demands for numerous types of springs vital to the production of reliable weapons. The service conditions under which many springs had to work were abnormally severe in comparison with peace time uses, and it was essential for the industry, in spite of difficulties affecting raw materials, to ensure that springs capable of the highest possible duty should be supplied, and in greatly increased quantities.

Steps were taken, in conjunction with the technical branches of Government departments through the Superintendent, Technical Applications of Metals, Ministry of Supply, to initiate investigations covering design, materials and methods. This co-operative work was successful in its immediate purpose, and also indicated the future benefits to be secured by both manufacturers and users from continued research.

A Research Organisation has accordingly been formed and came into operation in October 1945. The scheme which has been adopted for the present provides for extra-mural researches to be carried out by post-graduate assistants at universities and represents the first step towards the ultimate object of establishing a central research organisation with activities adequate to maintain the highest possible technical standard. Researches, respectively on spring steels, on the effects of surface protection on the fatigue behaviour of springs, and on the relevant properties of cold drawn spring wire are in progress at Sheffield, Birmingham and Manchester. The research work is directed by the Research Consultant and administered as a whole by the Technical Committee of the Federation. A further activity of the Research Organisation is the publication of the *C.S.F. Bulletin*, containing the results of investigations with other articles and information of technical value. The Research Organisation has received the support of the Department of Scientific and Industrial Research as from April 1946, and is continuing to maintain close liaison with the design departments of the Services.

Although the research programme upon which the Federation has

embarked will be justified by its value to spring makers alone, it is clear that the results will be of considerable interest to industries which are users of springs or makers of spring materials, and that the greatest possible scope for application of the results can best be secured by wide co-operation. Associate membership is accordingly open to any firm with related interests.

Design and Research Centre for the Gold, Silver and Jewellery Industries

Goldsmiths' Hall, Foster Lane, London, E.C.2. Tel. : Monarch 1668.

President : The Prime Warden of the Worshipful Company of Goldsmiths

Chairman : G. C. H. Matthey

THE Centre was inaugurated on 1st October, 1946. It is the first to combine both design and research and, as such, it has been sponsored by the Council of Industrial Design and the Department of Scientific and Industrial Research.

The Design and Research Centre will provide the trade with a central authority and source of information on all matters calculated to benefit the industry through the improvement of design, and in the development and application of new manufacturing methods and materials.

The funds of the Centre are provided out of subscriptions from individual firms paid through their Trade Associations or independently, and from grants from the Worshipful Company of Goldsmiths, the Department of Scientific and Industrial Research and from the Board of Trade through the Council of Industrial Design.

The Council of the Design and Research Centre, as at present constituted, is composed of representatives of the following : Department of Scientific and Industrial Research ; Council of Industrial Design ; the Worshipful Company of Goldsmiths ; British Joint Association of Goldsmiths, Silver-smiths, Horological and Kindred Trades ; the Master Silversmiths' Association, Sheffield ; the Federation of Master Goldsmiths and Jewellers, London ; the Manufacturing Silversmiths Association ; the London Wholesale Jewellers and Allied Trades Association ; the National Association of Goldsmiths ; Educationalists—London, Birmingham, Sheffield ; Trade Unions—National Union of Gold, Silver and Allied Trades ; The Society of Goldsmiths, Jewellers and Kindred Trades.

The following acting appointments have been made : Director of Design and Honorary Secretary, G. R. Hughes, C.V.O. ; Director of Research, Professor R. S. Hutton, D.Sc. ; Honorary Treasurers, B. J. J. Tyldesley, F.C.A., F. S. E. Fawkes, F.C.A. ; General Secretary, C. Bunyard.

Gas Research Board

Gas Industry House, 1, Grosvenor Place, London, S.W.1. Tel. : Sloane 8266.

President : The Rt. Hon. The Viscount Falmouth, B.A., C.I.E.E., M.I.Mech.E.

Director of Research : J. G. King, O.B.E., D.Sc., Ph.D., A.R.T.C., F.R.I.C.

THE Gas Research Board was formed in 1939 to organise, co-ordinate and expand the research and development work of the British gas industry. It took over on its inception the direction of the programme of pure and

applied research work then being carried out by the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds and other specialised research committees of the Institution, through a research staff working at the University under the Livesey Professor.

The Board was registered on 31st March, 1941; incorporated on 2nd May, 1941, under the Companies' Act 1929; and became associated with the Government Department of Scientific and Industrial Research as a Research Association on 1st January, 1943. In June 1943, Dr. J. G. King was appointed its first Director. It is governed by a Council of 18 members, nine of whom are appointed by the Institution of Gas Engineers, six by the Society of British Gas Industries, and three (who are non-voting) by the D.S.I.R. In addition there are two co-opted members.

In spite of wartime difficulties, the programmes of the Joint Research Committee, and several new programmes, chiefly concerned with the utilisation of gas, have developed as staff and facilities permitted, three of them to the point of experiment on an intermediate-scale. This larger-scale work has been carried out at the works of members of the Board, and laboratory accommodation for a research staff which now numbers 45 has been made available at the University of Leeds and Imperial College, South Kensington, pending the building of a headquarters establishment. At the latter also an Intelligence Section has been created to serve, when fully established, the Board's own research staff and those of the gas undertakings and manufacturers of appliances and equipment for the British gas industry who are members of the Board.

In the year of the formation of the Board it was estimated that these latter bodies were spending approximately £400,000 per annum on research and development. These researches by the individual members have continued and will not be affected by the development of centralised research work, since the main object of the Board is to correlate its own work with the interests of and the investigations being made by its members, and to undertake general investigations on matters of common interest on behalf of the industry, many of which researches could not conveniently be carried out by any one organisation. The Board will also carry out larger scale development investigations where necessary which would also, in many cases, be economically impracticable for its members. This policy was in fact broadly defined in the following terms in a paper on this subject by its first Chairman, as being: "To stimulate the application of existing knowledge and to encourage the search for new knowledge, thereby assisting the gas industry of the United Kingdom to discharge more effectively its duty to the community."

The current position of the researches in hand and other details of the Board's organisation and activities are to be found in its last Annual Report but, simply stated, the principal objectives are: To widen the range of raw materials which the industry can efficiently use; to extend the industrial usage of gas; to reduce the amount of organic sulphur compounds in gas supplied; to improve the system of distribution of gas, particularly by the use of higher pressures; and, by investigating new processes and improving existing methods, to gain greater freedom in the manufacture of gas and by-products as regards volume of demand and product prices. To achieve this objective the Board has active programmes of work in progress on the gasification of coal in hydrogen under pressure, the synthesis of methane,

purification of coal and synthesis gas, surveys of gas quality, heating and drying by radiation, causes of corrosion in gas appliances, and several other problems of gas utilisation.

The results of the investigations of the Board are circulated to its members and are thus made available for development and practical application by them. The Secretary is Dr. W. T. K. Brauhnoltz, M.A., Ph.D., F.R.I.C.

Lace Federation Research Council

71, Upper Parliament Street, Nottingham. Telephone : Nottingham 3465.

Chairman : Leonard S. Pentecost, M.C.

Research and Liaison Officer : John C. MacCallum, B.Sc.

IN March 1944 the Federation of Lace and Embroidery Employers Associations, a body comprising some 12 sectional trade associations covering all branches of the lace industry, set up a Research Committee to explore the possibilities of co-operative research for the lace industry. As a result certain work was done in connection with new yarns, lubrication, mending, lighting and other problems. This was, however, rather limited in character, owing to lack of funds, and it was agreed to widen the scope and set up a full research body if possible. A research fund was, therefore, organised with contributions from the sectional trade associations and also from the lace machine builders. An approach was then made to the Department of Scientific and Industrial Research, and as an outcome of these discussions the Lace Federation Research Council was formed which also included representatives from Nottingham University College and Technical College. This Council is recognised as a grant earning body on the lines of the regular Research Associations, for a temporary period of three years, on the understanding that before the end of that period an expanded scheme will be put forward to enable the Research Council to be raised to the full status of a Research Association.

In September 1946, a Research and Liaison Officer was appointed to draw up a research programme and to organise and co-ordinate the work. Research will be conducted into the improvements in machines and methods of the Levers, Plain Net, Curtain, Warp, Multi-needle Embroidery, and Barmen sections of the trade ; into methods of dyeing and finishing of lace products ; and into the standardisation and properties of yarns and the use of new types of fibres. It is hoped eventually to set up laboratories but in the initial stages arrangements will be made for some of the research projects to be carried out in other research centres.

Membership at present comprises all the members of the constituent trade associations of the Federation of Lace and Embroidery Employers Associations, *i.e.* all the sectional bodies who contributed to the existing research fund. Membership is open, however, to other British companies or firms (*i.e.* firms with at least 51 per cent. British capital and control) which may also be engaged in the production, processing, or marketing of lace and allied products (*i.e.* products of the Levers, Plain Net, Curtain, Warp, Multi-needle Embroidery, Barmen and other types of machine producing similar goods), and which are not members of the Federation. The subscription rates for new members have still to be arranged.

The present research programme includes the following items : The lubrication problems peculiar to the lace machine ; methods of winding and warping ; the tensioning of Jacquard strings ; and the hardness testing of warp lace needles. A library and information service has also been started, and a *Research Bulletin* is published at intervals.

Linen Industry Research Association

The Research Institute, Lambeg, Lisburn, Co. Antrim. Tel. : Lisburn, 2255.

Chairman of the Council : H. B. McCance

Director of Research : A. J. Turner, M.A., D.Sc., F.T.I.

THE main objects of the Association (registered in 1919) are to promote co-operation amongst Northern Irish, Scottish and English firms engaged in the various operations connected with the British linen industry, with a view to establishing a national scheme of research into the problems presented by the industry. The work of the Association includes the investigation of problems arising in all branches of linen manufacture—the cultivation, retting, scutching, and preparation for spinning of flax and kindred fibres ; the spinning of the fibres and their manufacture into cloth and other articles ; and the bleaching, dyeing, finishing, and preparation for market of linen goods.

The governing body of the Association is the Council which comprises 25 members, representing the various trade associations, the Government departments concerned, and educational bodies.

THE RESEARCH INSTITUTE

The Institute is at Lambeg, near Belfast, and its research work has covered the whole field of operations from the propagation of the seed to the complete production of the finished goods, including the investigation of by-products and waste. The brief account that follows of the work of the different departments shows it to be of a highly technical nature, but very important help has been given to manufacturers, while for farmers the most notable achievement has been the evolution of strains of pedigree flax, foremost among which are Liral Prince and Liral Crown, whereby the yield of fibre flax per acre has been increased by some 50 per cent. or more. The Institute is supported by contributions from (1) the linen trade in Northern Ireland, Scotland, and England ; (2) The Imperial Government (Department of Scientific and Industrial Research) ; and (3) The Northern Ireland Government.

SPINNING DEPARTMENT. (Head : J. A. Matthew, M.Sc., A.R.C.S., F.Inst.P., F.T.I.). This has laboratories equipped for physical measurements of the properties of flax-straw and fibre and of the various machine-products at all stages of fibre production, and preparing and spinning ; also technical laboratories equipped with small units of standard production machinery, so that all the usual sequence of operations can be performed in the laboratories and yarn can be produced from a given lot of flax-straw.

WEAVING DEPARTMENT. (Head : H. Boffey, B.Sc.). The work of the Weaving Department falls into three main sections whose objects are :

(1) To get the most efficient production ; (2) to improve cloth quality ; and (3) to design the best fabrics for specific purposes.

Under section (1) comes experimental work on the machinery used for winding and weaving.

Section (2) also entails much study of the machinery, especially the loom in order to avoid defects in cloth which detract from its serviceability or appearance.

Section (3) involves the designing of testing-machines, the devising of new methods of testing, and the maintenance of a close link between the laboratory and the textile trade.

CHEMISTRY DEPARTMENT. (Head: D. A. Derrett-Smith, B.Sc., F.R.I.C., F.T.I.). The activities of this Department comprise investigations of the retting of flax-straw, the bleaching, dyeing, and finishing and also the laundering of linen fabrics.

Closely connected with the chemical processing which linen goods receive is their behaviour in use and laundering, and this forms a highly important branch of the work of the Chemistry Department.

TESTING AND LIAISON DEPARTMENT. (Head: W. H. Ewing, B.Sc.). This Department is concerned mainly with routine physical and chemical tests on textile materials, to determine their quality, composition and construction. Examination of defective or damaged yarns and fabrics is also made to discover the causes of defects and possibilities of eliminating them. The Secretary is H. S. Eaton.

Motor Industry Research Association

Great West Road, Brentford, Middlesex.

Telephone : Ealing 4741.

Chairman : E. A. Evans, M.I.A.E.

Director of Research : A. Fogg, M.Sc., A.M.I.Mech.E.

THE Motor Industry Research Association was formed in January 1946, to take over and carry out research work previously organised by the Automobile Research Committee of the Institution of Automobile Engineers.

The Association is governed by a Council, members of which are appointed by the Society of Motor Manufacturers and Traders Ltd., the Institution of Automobile Engineers, the Department of Scientific and Industrial Research and representatives of direct subscribers.

The principal aim of the Association is to conduct research on problems of common interest to the motor industry. Research of this kind results in a general improvement and development in vehicles ; in increased demand ; and, therefore, in a more prosperous industry. It is, therefore, in the interest of all manufacturers and operators associated directly or indirectly with the motor industry, to support the work of the Association.

The Research Association possesses well-equipped laboratories for experimental work on engines, materials and general engineering problems, with good workshop facilities, and also chemical, physical and metallurgical sections.

In addition to experimental work in these laboratories, researches are undertaken at universities and similar institutions. For example, an extensive investigation on the deep-drawing properties of materials is in progress

for the Association at the University of Sheffield. Extra-mural research on fuel injection in spark-ignition engines is being undertaken at Queen Mary College, University of London, and on piston ring flutter at the University of Cambridge.

The research programme is prepared by a Research Committee, with the assistance of Specialist Sub-Committees and Panels appointed to deal with the main sections into which subjects for investigation may be separated. These relate to Power Unit; Power Transmission and Vehicle Control; Vehicle Structure; Vehicle Performance; Fuels and Lubricants; Materials and Manufacturing Processes; and Instrumentation. Each Sub-Committee and Panel consists of experts representing the manufacturing interests, with power to co-opt specialists to advise on any particular problem. Research reports on the investigations undertaken are issued to members of the Association. Many of these reports are subsequently published in the technical press.

While the main function of the Motor Industry Research Association is to carry out research work on problems of general interest to the whole industry, or a section of it, assistance is also given to companies requiring help with individual problems. Private tests may be carried out for members when the Association possesses special facilities not readily available elsewhere and if the work will not interfere with the progress of the Association's researches.

The Association maintains an Information Section and a library and issues a quarterly *Bulletin*.

Most of the firms in the motor industry are members of the Association. The list of members includes the principal manufacturers of vehicles and engines, motor cycles, accessories, tyres, materials and allied products, together with the main oil companies and operators of road-fleets.

The Association receives its financial support from member companies and, in addition, receives a grant from the Department of Scientific and Industrial Research, the amount of this grant being related to the industrial subscriptions.

British companies and British subjects engaged in the manufacture or development of motor vehicles, of parts or materials, accessories or components to be incorporated therein, or any fleet operator approved by the Council, are eligible for membership of the Association.

Parsons and Marine Engineering Turbine Research and Development Association (PAMETRADA)

PAMETRADA Research Station, Wallsend-on-Tyne. Tel. : Wallsend 64061.

Chairman : P. B. Johnson

Director of Research : Dr. T. W. F. Brown

THE Association, whose abbreviated title is PAMETRADA, is a Research and Development Association set up in 1944 by a large number of marine engine-building firms to carry out research and development work with the object of improving the design and efficiency of steam and gas turbines,

reduction gearing and associated auxiliaries for marine propulsion. The present list of members is as follows: Barclay Curle & Co.; John Brown & Co.; Cammell Laird & Co.; Central Marine Engine Works; William Denny & Bros.; Fairfield Shipbuilding & Engineering Co.; Harland & Wolff Ltd.; R. & W. Hawthorn, Leslie & Co.; J. G. Kincaid & Co.; Parsons Marine Steam Turbine Co.; C. A. Parsons & Co.; Richardsons Westgarth & Co.; David Rowan & Co.; Scotts' Shipbuilding & Engineering Co.; A. Stephen & Sons; John I. Thornycroft & Co.; Vickers-Armstrongs Ltd.; Wallsend Slipway & Engineering Co.; J. S. White & Co.; Yarrow & Co. Any further applications for membership, which is open only to British subjects or corporations, would be dealt with individually by the Council. The Association is financed by capital and revenue payments contributed by the member firms and it has been approved for grant aid by the Department of Scientific and Industrial Research.

The Association has set up a Research Station at Wallsend-on-Tyne and the first portion of the building scheme has been completed, comprising a test bed with a hydraulic dynamometer capable of absorbing 60,000 s.h.p. on one shaft, and pumps supplying $3\frac{1}{2}$ million gallons of water per hour for dynamometer and main condensers. There is also a boiler house to accommodate the steam generating plant appropriate to the turbine installation under test, and a research house equipped with a high pressure boiler (1,200 lb./sq. in., 950°F.), portable steam turbine power unit developing 4,000 b.h.p., and low pressure aerodynamic test plant for wind tunnel investigations. An administrative block to house the Association's technical and administrative staff, now numbering over 50, is in occupation.

The second part of the building programme is now under way and will comprise machinery for aerodynamic model tests and investigations on combustion chambers and heat exchangers utilising air compressing plant absorbing 4,000 b.h.p., together with a further laboratory and drawing office.

The main object of the Association is the improvement of marine turbine installations both by full-scale testing and by experimental research. In addition it provides its members, on request, with basic design particulars for projected marine turbine installations. During the first two years of operation over 150 such inquiries have been dealt with, and this service has naturally involved the production of considerably more than 150 designs, since in many cases alternative proposals had to be investigated.

Printing and Allied Trades Research Association (PATRA)

*Charterhouse Chambers, Charterhouse Square, London, E.C.1. Telephone :
Chairman : Sir Robert Leighton Clerkenswell 8115.
Director of Research : Dr. G. L. Riddell*

THE Printing and Allied Trades Research Association is an organisation operating under the ægis of the Department of Scientific and Industrial Research. There are two Divisions—Printing and Packaging, the work of the Packaging Division being concerned with packages made primarily from paper and similar products. The Association is supported by firms

engaged in printing, newspaper production, bookbinding, papermaking and inkmaking and by the manufacturers and users of packages. The income is derived from the subscription of member firms, augmented by an annual Government grant which is dependent on the income received from the industry. The Association is controlled by a Council representative of the industry, and a Research Committee with advisory panels directs the research programme.

The primary activity of the Printing Division is fundamental research on the printing processes, paper-using and printing ink. The Packaging Division concerns itself with technical problems arising from the manufacture and use of packages ranging from simple wrappers to complicated fancy boxes and fibreboard containers. The Association maintains a library and an Information Service, and issues publications.

INVESTIGATION. Members are able to consult the Association on day-to-day problems and difficulties which arise in their manufacturing processes.

LABORATORIES. The laboratories of the Association were lost by enemy action in 1941. Since that time work has been carried out in laboratories at Stonebridge Park, Boxmoor and at the Smithfield Laboratory in London. The Council plans for a considerable increase in the activities of the Association directly its new laboratories are completed. A site of four acres has been purchased at Leatherhead where it is proposed to establish research laboratories, library and offices. These, it is hoped, will be ready for occupation in 1947.

Production Engineering Research Association of Great Britain (PERA)

Staveley Lodge, Melton Mowbray, Leicestershire. Tel. : Melton Mowbray 561.

President : The Right Hon. Lord Riverdale

Director of Research : D. F. Galloway, Wh.Sc., M.I.P.E., A.M.I.Mech.E., A.M.I.E.E., B.Sc.Hon.

THE Production Engineering Research Association of Great Britain has been formed with the object of assisting British industry to improve its productive efficiency. The researches will cover the whole range of production engineering activities, leading to improved design, quality, and utilisation of production equipment. Membership is open to both manufacturers and users of tools, machine tools, gauges, cutting fluids, etc., which includes makers of industrial plant, automobiles, aircraft, electrical industrial and domestic equipment, rolling stock, agricultural machinery, household utensils, etc.

PERA was incorporated on the 13th June, 1946, and on 1st July took over the staff, equipment, and other assets of the Institution of Production Engineers Research Department, which had been established in 1939. The organisations responsible for founding the Association are the Institution of Production Engineers, the Machine Tool Trades Association, the Gauge and Tool Makers' Association, and the National Federation of Engineers' Tool Manufacturers.

PERA receives financial assistance from the Department of Scientific and Industrial Research on the basis of £15,000 per annum for the first £15,000

per annum subscribed by industry, and thereafter pound for pound up to a maximum of £35,000 from industry and £35,000 from the D.S.I.R., *i.e.* a total annual income of £70,000.

The activities of PERA include: (a) Research in the laboratories at Melton Mowbray; (b) field research, *i.e.* research on production sites in members' factories; (c) the development and carrying out of new standard tests for production equipment and materials, *e.g.* machinability tests, formability tests, cutting fluids tests, etc.; (d) the operation of an Information Service; (e) the issue to member firms of a monthly *PERA Bulletin* containing production engineering abstracts; (f) the issuing of reports of the work of the department in a form adapted to be of practical value in improving the efficiency of engineering production; (g) the establishment of a library containing production engineering literature, in the form of books, research reports, pamphlets, reprints of papers, standard and patent specifications, etc.; (h) the convening of lectures, demonstrations, and other meetings for the discussion of current developments in production engineering; and (i) special educational schemes.

The research programme includes such items as: Machinability of materials; formability of sheet metal; performance of machine tools, cutting tools and abrasives; performance of cutting fluids, etc.; and some aspects of other manufacturing processes such as welding, extrusion, manipulation of plastics, jigs and fixtures, foundry practice, heat treatment, vibration, corrosion, etc.

The internal organisation of the Association is divided into three sections, namely, the Research Department, the Information Department, and the Secretarial Department. The investigators in the Research Department will be assisted by experts in metallurgy, metrology, instrument design, photography, microscopy, etc.

Research will be undertaken (a) on problems of immediate interest to all members or to groups of members, (b) into the fundamental principles of manufacturing processes.

The Information Manager is A. V. Wood, D.L.C., and the Secretary is F. Richards, F.Comm.A., F.S.C.

Research Association of British Flour-Millers

Old London Road, St. Albans, Herts.

Telephone : St. Albans 640.

President : J. Arthur Rank, D.L., J.P.

Director of Research : T. Moran, C.B.E., D.Sc., Ph.D.

THE Research Association was founded in September 1923 and its first Director of Research appointed in February 1924. Laboratories were built at St. Albans which have been extended at intervals so that now they are a well-equipped unit with every facility for pure and applied research on wheat, wheat products and cereals generally. The total staff is 40, made up of 16 graduate research workers and 24 clerical and assistant staff. Besides the usual research laboratories there is a library taking most of the important British and foreign scientific journals, experimental milling plant, wheat and flour stores, and a test bakehouse; in addition there is a large workshop in which experimental and pilot plants can be erected and tested.

The Research Association is governed by a Council on which sit two distinguished scientists nominated by the Department of Scientific and Industrial Research. Its day-to-day activities are in the hands of a small Executive Committee.

Prior to the outbreak of war the annual income of the Association was approximately £14,000, made up of £9,500 from the milling industry, £2,500 from the D.S.I.R. and the remainder in miscellaneous fees; it is now approximately £25,000. The Association is primarily a research organisation and as far as possible routine consultant work is left to the practising cereal chemists. The results of the researches are published in the different scientific journals but in addition a number of comprehensive reports (45 to date) on specific subjects have been printed and circulated to members; many papers and bulletins on a wide range of practical problems have also been circulated. A number of patents have also been taken out by the Association.

Before the war, much of the research was focused on improvements in milling practice and milling technology generally but a considerable proportion was directed towards improvements in breadmaking and bread quality. The loaf is after all the yardstick of the quality of the wheat and the millers' skill lies in blending and milling it so as to give the best bread-making flour. Three examples will illustrate the type of investigation carried out in the pre-war period.

(1) *Sifting*. An important place in milling is filled by machines (some of which are known as plansifters) for sifting and grading particles accurately according to their size. After a study of the sifting process the Association introduced a modification in the design of plansifters which considerably increased their efficiency. This was incorporated in machines exported by British milling engineers and is known more than once to have been a determining factor in securing a contract for milling equipment abroad in competition with foreign milling engineers.

(2) *Starch Damage*. During the grinding, or reduction in stages, of wheat to flour, the starch granules are mechanically damaged to varying extents. An extensive investigation showed that only the damaged granules contribute to the essential fermentation processes in the rising of dough, and showed too how the extent of starch damage may be controlled.

(3) *Dough Testing*. The physical properties of dough made from different flours, which may vary greatly, largely determine bread quality. It is important to maintain these dough properties at a uniform level and to do this satisfactorily it is essential to measure them—a difficult physical problem. After many years' study of this problem an instrument was designed to make this measurement simply and reliably. This instrument has proved of inestimable help in the study of all manner of flour problems.

Soon after war broke out the laboratories became the headquarters and centre for all research on flour and bread for the Ministry of Food; in 1943 the Ministry took over control for the duration of the war, the name being changed to the Cereals Research Station. Dr. Moran was at this time Director of Research of the Ministry of Food and in this capacity continued to direct the work of the laboratories, which were returned to the Research Association on 1st January, 1946. During the war the labora-

tories carried out much of the necessary work involved in the specification for national flour, the fortification of flour with calcium carbonate, control in the quality of the national loaf and the many problems involved in producing the most palatable and nutritious loaf with the limited supplies of wheat and under the rigorous conditions of war, when nothing must be wasted. In all this work intimate contact and co-operation was maintained with other research bodies including the Medical Research Council, the Lister Institute and different university laboratories. With our restricted supplies of animal protein and imported foods generally bread was undoubtedly our most important foodstuff and was called upon to supply not only over one-third of our energy requirements but also liberal proportions of the B vitamins, iron, calcium and other accessory factors essential for good health and morale. Despite, however, the urgency of the problems the work of the laboratories was not merely *ad hoc* research; indeed many of the problems could only be solved by a prior piece of fundamental research, and this is shown by the many scientific papers published from the laboratories during the war. Perhaps the most resounding research was that showing the high nutritional quality of the scutellum fraction of the germ and the outer endosperm, findings which decided the Government to reduce the extraction of national flour from 85 per cent to 80 per cent thus giving a more acceptable loaf without any appreciable reduction in nutritional quality.

The post-war policy of the Research Association is clear enough. It is busy on a number of problems arising out of the Report of the Conference on the Post-War Loaf. It will also continue by its research and its position inside the milling industry to raise the scientific efficiency of the industry. In this connection more than the pre-war staff will be available to maintain intimate liaison with the industry and additional staff will be recruited as the work develops. Finally it will expend much of its resources on fundamental research which, by its outlook, equipment and knowledge of the milling industry, it can carry out better than any other laboratory. It will, however, be that type of fundamental research which is positive, in the sense that it will point, however remotely, to possible useful application.

Inquiries should be sent to the Secretary, H. G. Hall.

Research Association of British Paint, Colour and Varnish Manufacturers

Paint Research Station, Waldegrave Road, Teddington, Middlesex.

President : C. A. Klein

Telephone : Molesey 1063.

Director of Research : L. A. Jordan, D.Sc., A.R.C.Sc., F.R.I.C., M.I.Chem.E.

THIS Research Association was founded in 1926. In common with other research associations, it operates under the aegis of the Department of Scientific and Industrial Research, and is financed partly by subscription income from the membership (consisting of firms engaged in the manufacture of paint and allied materials) and partly by Government grant.

The laboratories of the Association at the Paint Research Station, Teddington, are well equipped for the application of scientific methods to the problems of the related industries, which include those concerned with

paint, colour, varnish, printing ink, linoleum, leather-cloth, etc. The main activity is research and investigation. There is in addition a library and an information bureau service, with provision for the answering of technical inquiries and for liaison work generally.

New schemes have now been put into operation providing for a substantial expansion of activity involving additional accommodation and a much increased scientific staff.

The experimental work carried out is complementary to that of individual firms. The results are transmitted to the members as confidential *Technical Papers*; some work of immediate practical significance is published without delay, in condensed form, as confidential *Research Memoranda*, and other publications are issued.

The affairs of the Association are in the hands of a Council, which in technical matters delegates its functions to a Technical Advisory Committee. This in its turn supervises the work of nine Subject Panels, dealing with the following: Drying oils and their treatment, including the linoleum and leather-cloth interests; Varnishes, and natural and synthetic resins; Pigments and chemical colours; Paints and paint preparation; Paint application; Cellulose and other lacquers; Testing; Bitumen, blacks and pitches; Anti-corrosive and other industrial protective paints.

The members of these Panels are mainly individuals with specialised interests drawn from the personnel of member firms, and thus the close relationship between the research work on the one hand and the problems of the industry on the other is maintained.

The staff is arranged so as to provide, in effect, nine research teams, with general staff, chemical, physical, and technical, to deal with fundamental background work. The Secretary is S. H. Bell, Ph.D., A.R.C.Sc., F.R.I.C.

Research Association of British Rubber Manufacturers

105-107, Lansdowne Road, Croydon, Surrey. Telephone: Croydon 6105.

President: A. Healey, B.Sc., F.I.R.I.

Director of Research: J. R. Scott, Ph.D., M.Sc., F.R.I.C., F.Inst.P., F.I.R.I.

THE Research Association is one of a number of industrial Research Associations inaugurated mostly in the period 1919-1920 under the ægis of the Department of Scientific and Industrial Research for the purpose of studying problems relating to important manufacturing industries, and ranging from the investigation of raw materials to the properties and performance of the finished products. It was founded primarily to study problems of interest to rubber manufacturers, which embrace natural and synthetic rubbers, the many compounding ingredients, such as fillers, anti-oxidants, and accelerators, and the accessory materials such as textiles, solvents, etc., used in the processing and manufacture of rubber goods.

ADMINISTRATION. The Association is a self-governing body constituted on a national basis maintained by means of voluntary subscriptions from member firms supplemented by a Government grant. It is controlled by

a Council, consisting of elected representatives of member firms which are Ordinary Members, together with a representative of the D.S.I.R. A number of the members of the Council are elected to represent specific branches of the industry.

MEMBERSHIP. Membership consists of (1) Ordinary (Full) Members, who may be rubber manufacturers and suppliers of machinery and plant, compounding ingredients and other accessories used in the industry (rubber manufacturers may only join as Ordinary Members); (2) Associate Members, who may be suppliers, users of rubber products, or other concerns or individuals interested in the industry; and (3) Dominion Members, who are rubber manufacturers or suppliers in any British Dominion.

ORGANISATION. Under the control of the Director of Research, the Association's activities are grouped into three main Divisions, *i.e.* Research; Development; and Intelligence.

RESEARCH DIVISION. This is responsible for fundamental investigations on the chemistry and physics of natural and synthetic rubbers and on the basic processes of rubber manufacture; the study of the effects of compounding ingredients, etc.; and the study of the properties of vulcanised products under varying conditions, including the development of methods of testing.

DEVELOPMENT DIVISION. This is responsible for consultative and advisory work on behalf of members, Government departments and other organisations, and for investigations on general technological problems.

The Association maintains an Intelligence Division (which answers inquiries and issues publications) and a library.

PLANS FOR POST-WAR PERIOD. The type of research carried out will depend on the relative positions of natural and synthetic rubbers. With the reoccupation of the Far East plantations and the large output of natural rubber which will be forthcoming, the consumption of natural rubber by the manufacturers, *vis-à-vis* the consumption of synthetic rubbers, will depend, apart from political and economic factors, on the suitability of the various products for specific uses. Accordingly, extensive fundamental and technological studies on the characteristics of synthetic and natural rubbers are planned, and in part already in progress. Arrangements have been made for certain fundamental research to be carried out extra-murally.

Wool Industries Research Association

Torridon, Headingley, Leeds.

Telephone : Leeds 51047.

Chairman : Henry S. Clough

Director of Research : B. H. Wilsdon, M.A., B.Sc.

THIS Association, founded in 1918, conducts research in connection with the production, processing and utilisation of wool. It is governed by a Council elected by the members representing all sections of the industry. The Association is supported by voluntary contributions from individual member firms of the industry, by grants from the Department of Scientific and

Industrial Research depending upon the amount subscribed voluntarily and by a levy on imported wool ; in addition financial support is received from the three wool-producing Dominions, *i.e.* Australia, New Zealand and South Africa ; and from the International Wool Publicity and Research Secretariat for the furtherance of research work carried out on its behalf.

Though largely engaged on carefully planned long-term research on fundamental problems connected with wool, including all the other animal hairs such as mohair, alpaca, camel hair, cashmere, cowhair, etc., the Association has been enabled, by the public-spirited manner in which individual members have allowed their plant and machinery to be used for experimental purposes, to make exhaustive studies under efficient commercial practice of all processes of wool textile manufacture. The work of the Association's laboratories is organised in sections corresponding to the basic science concerned ; the technical sections (manufacturing and chemical) are centres of liaison work with the industry. The liaison work consists in helping and advising members regarding any problems or difficulties of a technical nature that arise in their work. It should be noted, however, that the Association does not undertake routine testing or analytical work, this being the recognised province of testing houses and consultants. A library and an abstracting and information service are maintained for the benefit of members.

The greater part of the Association's work is carried out in its laboratories at Torridon, Headingley, Leeds ; but branch laboratories have been established at Nottingham in connection with the hosiery industry and at Galashiels in connection with the Scottish tweed industry. The Association also owns sheep for experimental work on wool production, which is carried out in collaboration with other bodies with whose interests its own to some extent overlap.

The results are made available to members through the Association's *Bulletin* and private publications. Work of purely scientific interest is communicated to the appropriate scientific journals. In addition, the services of members of the staff as lecturers are utilised by the various technical societies connected with the industry. The great importance of linking up the work of the Association with instruction in wool technology given in the textile schools of this country has been recognised by the Association, and textile teachers' conferences are held at which the results of recent work on particular subjects are discussed so that they may pass on to their students the knowledge gained. In addition, textile teachers are supplied with the *Bulletin* and certain publications to enable them and their students to keep in close contact with progress in research.

A Development Committee was appointed in 1943 and has decided upon the following : Increased accommodation and staff for research in the scientific study of wool textile processes and provision for research students ; complete pilot plant covering the principal important technical operations ; engineering research ; and closer liaison with the industry by means of local officers and branch laboratories. A considerable scheme of expansion is now in progress by which increased laboratory accommodation and facilities for engineering research will be provided.

DEVELOPMENT ASSOCIATIONS

Aluminium Development Association

33, Grosvenor Street, London, W.1.

Telephone : Mayfair 7501.

President of the Council : The Hon. Geoffrey Cunliffe

Director-General : W. Helmore, C.B.E., Ph.D., M.Sc., F.C.S., F.R.Ae.S.

Technical Director : E. G. West, Ph.D., B.Sc., F.I.M.

THE main object of the Aluminium Development Association is to encourage the increasing use of aluminium and its alloys in all economically suitable forms. The Association was founded at the end of 1944 and absorbed the Wrought Light Alloys Development Association which had operated since 1941.

Government departments, local authorities and other official bodies recognise the Association as the impartial representative of the aluminium producing and fabricating industry, which sponsored it and supports it, on all aspects of technical development. To this end, the Association has representatives on official and research associations such as the Research Committees of Government departments and Collateral Research Associations, and the British Standards Institution. The Association also acts as a link between the aluminium industry and other industries, but takes no part in the trading activities of its members.

The broad aim of the Association is put into practical effect by Committees of representatives of member firms with whom the technical staff of the A.D.A. work in close co-operation. Six permanent committees deal with the subjects of Building, Marine, Publications, Rail and Road Transport, Research, and Standards; other committees are formed for special work as the need arises. In brief the committees examine possible applications of aluminium in their respective fields, give advice on problems submitted to them, and prepare written material for circulation within the industry or for publication as circumstances dictate. Publications are the special responsibility of the committee concerned.

Research work is sponsored by the Association and undertaken by Government or university laboratories, by research associations, consultants or by member firms. The Association's staff includes specialists in the main fields of application who are available to produce designs which may be translated into prototypes, to prepare stress calculations and generally to act as consultants for the aluminium-using industries.

At the headquarters in London a library is maintained under the supervision of the Information Officer. Thus the Association is able to give authoritative advice on problems submitted to the Technical Advisory Service, and thousands of such inquiries have already been answered. A library of films is available on loan to *bona fide* inquirers (for details see *Films Section*). Members of the staff also give lectures at colleges, institutions and works.

The object of the A.D.A. is pursued in a wider field through technical and general press publicity and by means of exhibitions. The Association's own exhibition *Aluminium—War to Peace* shown in London and at six provincial cities was seen by over 800,000 persons. This has been discontinued, having served its purpose, but the Association continues to take part in other exhibitions such as the *Ideal Homes Exhibition* and the *British Industries Fair*.

British Electrical Development Association (E.D.A.)

2, Savoy Hill, London, W.C.2.

Telephone : Temple Bar 9434.

President : The Rt. Hon. Lord Brabazon of Tara, P.C., M.C.

THE British Electrical Development Association is a non-profit earning organisation formed in 1919, to encourage the greater use of electricity. Membership of the Association is confined to authorised electricity supply authorities (both company owned and municipal) and the Central Electricity Board.

E.D.A. can be described as the "Public Relations" organisation of the electricity supply industry, and in that capacity has contact with practically every section of the community. This contact is maintained through a variety of channels, chief of which is the public press. The Association has spent hundreds of thousands of pounds in advertising campaigns in the national and technical press and has given extensive service in connection with the local advertising of individual electricity authorities. Advice and information are provided to journalists with the result that the reading public are kept fully informed on all developments in the electrical industry. The association, in normal times, publishes and circulates millions of pamphlets and books on all angles of the use of electricity—and this important aspect of E.D.A.'s work is being resumed although paper supplies do not permit it to be on the pre-war scale.

Among the many services which E.D.A. gives to its members is a wide range of films, for exhibition either in public cinemas, or at gatherings in schools, village halls, camps, etc.

Another important branch of the Association's work is the organising of electrical exhibitions. Since the end of the war it has concentrated largely on exhibitions of planned electric kitchens. In 1947, in addition to taking part in Housing Exhibitions, the Association is to stage electrical exhibits at the leading Agricultural Shows. The Association has also purchased cooking equipment to ensure that the catering at the "Royal" and other national agricultural shows is "all-electric".

The domestic application of electricity has always taken a large place in E.D.A.'s activities, and housewives are constantly being advised how this great public service can lighten their burdens. The "all-electric" house is the ideal that E.D.A. has kept before the public, organising competitions among architects for the best designs of electric kitchens for small and medium-sized houses, and establishing a house-planning service which is at the disposal of local authorities, architects, builders or private citizens. The Association also gives assistance and guidance on how to introduce electric light and power to existing houses, and has conducted campaigns in support of the wiring of houses, and the introduction of electric cooking, water-heating and refrigeration.

Industry, too, is catered for by E.D.A. Expert advice on air-conditioning of factories and business premises is given to industrialists, while the principles of correct lighting and the economic and social advantages of good illumination are brought to the attention of business executives.

Improved street lighting as a means of reducing road accidents, tasteful lighting schemes for shop windows, better lighting and heating of hotels,

electric cooking by large-scale caterers, the development of the use of electricity on farms and in rural areas, the electrification of the railways and the mines, and the greater use of electrically-driven vehicles are yet other branches of the Association's interests. On all these subjects expert advice is given without regard to proprietary articles or systems.

The General Manager and Secretary is V. W. Dale.

Copper Development Association

Kendals Hall, Radlett, Herts.

Telephone : Radlett 5616.

Grand Buildings, Trafalgar Square, London, W.C.2. Telephone : Abbey 2677.

Chairman of the Council : Lt.-Col. The Hon. R. M. Preston, D.S.O.

THE Copper Development Association is a non-trading organisation supported by all sections of the copper industry and engaged in collecting and disseminating information, chiefly of a technical nature, on copper and copper alloys and their many uses.

The Association is controlled by a Council representing all member interests, the direction of its ordinary business being delegated to a Management Committee. Members' meetings are held bi-annually. The chief executive officer is the General Manager, G. W. Preston, M.B.E., M.I.E.E., and the staff comprises specialists whose qualifications and experience are related to the principal user industries.

Since the war, plans for a considerable expansion of the Association's activities have been put into effect. New headquarters, including a workshop, have been established at Kendals Hall, Radlett. The staff has been enlarged. All departments, including the new public relations department with offices in Grand Buildings, Trafalgar Square, W.C.2, have come into full operation. In addition to the technical information service the Association provides practical demonstrations and lectures, illustrated by films or lantern slides, free of charge, for suitable organisations and educational institutions.

Close liaison is maintained with other organisations interested in applications of copper, such as the British Non-Ferrous Metals Research Association, the British Electrical and Allied Industries Research Association, and the Copper and Brass Research Association in the United States, for the purpose of interchange of information and published material. The Association does not carry out research, being concerned mainly with the application in practice of the results of research. Experimental work on certain subjects, chiefly of interest to the building industry, is, however, being undertaken on an increasing scale.

Iodine Educational Bureau

Stone House, Bishopsgate, London, E.C.2.

Telephone : Bishopsgate 8321.

Director : Francis C. Kelly, B.Sc., Ph.D., F.R.I.C.

THE Iodine Educational Bureau is a non-commercial organisation established in 1938 by the Chilean producers of iodine. Its purpose is to collect all published scientific information about iodine and to make it available

to institutions and business enterprises. The Bureau also issues publications.

The Bureau's files now contain 20,000 iodine references covering, in the main, the treatment of human and animal diseases, antiseptics, animal feeding, and numerous chemical and industrial purposes.

The Bureau does not engage in research but maintains contact with research scientists in Great Britain and abroad. It also collaborates with established institutions and investigators in carrying out laboratory and field experiments.

Lead Industries Development Council

*Eagle House, Fermyn Street, London, S.W.1. Telephone : Whitehall 7264.
Chairman : Major W. E. Grey*

THE Lead Industries Development Council is an advisory non-profit making organisation for the furtherance of research and development work and the dissemination of technical information on lead sheet and pipe. The Council is at present primarily supported by the lead sheet and pipe industry through the Federation of Lead Sheet and Pipe Manufacturers, but support from other lead using industries may be expected in the future.

The Council supports, by annual subscription, the British Non-Ferrous Metals Research Association to enable this organisation to carry out a scientific research programme on lead and its alloys. Research on methods of use and the collation of relevant information is carried out by the Council's own technical officers. The Council maintains a Technical Information Bureau with the function of dealing with inquiries from all users of lead sheet and pipe in the building and allied industries.

The Secretary and Manager is W. R. S. Hodgson.

Timber Development Association

*75, Cannon Street, London, E.C.4. Telephone : City 6146.
President : The Right Hon. The Earl of Dunmore, V.C., D.S.O., M.V.O.*

THE Timber Development Association was incorporated in 1934, its main purpose being the promotion of the common interests of all engaged in the production, exportation, shipping, importation, sale, distribution, preservation and utilisation of wood. It is a non-trading organisation and, following upon reorganisation in 1944, has had the support of all members of the Timber Trade Federation and of many allied industries with which the Association is co-operating in the maintenance of timber supplies and the advancement of a scientific and economic utilisation of timber.

Present organisation consists of a Council of 28 with the following Standing Committees : Finance and Planning, Public Relations, Education, Timber Utilisation, and Statistics and Information.

The policy of the Council and its Standing Committees is implemented through Headquarters' staff, linked with Regional and Area Organisations covering the whole of the United Kingdom and Northern Ireland. The

work of the Association may be briefly summarised under the following heads :

TECHNICAL ADVISORY WORK. This is closely connected with advice to Government departments and local authorities, architects and engineers and consumers of timber in general. Many inquiries are received and dealt with. Interest in the publications of the Association is world-wide and some quarter of a million T.D.A. publications were distributed during the past year.

LECTURES. Lectures are given to architectural societies, technical and other schools, H.M. Forces and other associations representing consumer interests.

LIBRARIES, FILMS AND LANTERN SLIDES. The Association maintains a standard reference library at Headquarters, branch libraries and college and school libraries. Films, lantern slides and photographs are available for lectures and other educational purposes.

BRITISH STANDARDS INSTITUTION COMMITTEES. The T.D.A. is represented on all the B.S.I. Committees covering the utilisation of timber.

CONSTRUCTIONAL RESEARCH. The Association formed a Constructional Research and Design Unit in the latter part of 1946 in order to meet the growing demand from the consuming industries for designs and design data to enable available supplies of timber to be used to the best possible advantage. This department provides a free advisory and design service to architects and engineers and is engaged on the compilation of design data, the lack of which has been a serious obstacle to the development of timber engineering in this country.

RESEARCH GENERALLY. The Association keeps very closely in touch with the Department of Scientific and Industrial Research, particularly the Forest Products Research Laboratory at Princes Risborough, and has a reciprocal arrangement for the exchange of information on development of recent research with all the leading timber research stations abroad.

EDUCATIONAL. In addition to the Standing Committee there is a National Education Advisory Committee comprising representatives from each area committee, the Ministry of Education, the Forest Products Research Laboratory (D.S.I.R.), the Association of Technical Institutions and the Association of Principals of Technical Institutions.

PUBLICATIONS. The Association has produced a series of Red Booklets and Leaflets on timber which can be obtained free of charge from Headquarters.

Inquiries should be sent to the Secretary, C. T. Tobutt.

Tin Research Institute

*Fraser Road, Greenford, Middlesex.
Director : John Ireland, M.C., B.Sc.,*

Telephone : Perivale 4254

THE Tin Research Institute was founded and is controlled and financed by the International Tin Research and Development Council which consists of delegates appointed by various governments to represent tin producers in the Belgian Congo, Malaya, the Netherlands East Indies, Bolivia and Nigeria.

The Head Office and Laboratory are at Greenford, Middlesex. The buildings comprise a metallurgical wing, a chemical wing, and an administrative building which includes a library. A feature of the organisation is the staff devoted to the service of technical information and practical assistance in all industrial operations using tin. This service is rendered without charge and is available to correspondents in any part of the world.

The research plan is based on a scientific study of existing uses of tin with a view to improving the quality of the final product and facilitating manufacturing operations. In addition certain promising new uses of tin, and new alloys and processes, are being developed.

A series of publications are issued free of charge which provide the latest scientific information on a number of industrial processes which have hitherto been empirical and imperfectly understood arts. Recent investigations have reduced these processes to a series of clearly defined and easily controlled operations, for which full working instructions are available, e.g.

Hot-tinning (mild steel, copper, etc.).

Hot-tinning of Cast-iron (bright continuous coatings are now obtainable).

Electro-deposition of Tin (the new methods are already widely adopted as very high-quality coatings are readily obtainable).

Electro-deposition of Speculum (an ornamental finish with the appearance of silver but tarnish-resistant and consisting of a tin-copper alloy).

Electro-deposition of Tin-Zinc Alloys (a new and highly protective coating for steel).

Improved Chill Cast Bronze. The new processes provide very high-quality bronze ingots of superior strength and freedom from porosity or surface defects. These processes provide a great advance in the manufacture of strip, wire, rods, bushes, gear wheels, etc.

The other uses of tin, including tinplate, solder, bearings, etc., are also the subjects of research and many contributions have been made to the solution of problems arising in their manufacture and use.

A programme of post-war activities is now under consideration by the tin producers. It will involve an enlargement of the research laboratories and staff but its particular feature will be the strengthening of staff devoted to technical service. It is planned to make this available in all countries through special training of selected nationals of each country. It is also planned to provide technical literature in many languages. This is deemed necessary because tin is employed in a very wide variety of industries, and in many cases by comparatively small users.

Zinc Development Association

Lincoln House, Turl Street, Oxford.
Director : R. Lewis Stubbs

Telephone : Oxford 47988.

THE Zinc Development Association was formed in 1938 to provide users and potential users of zinc with a comprehensive information service on the properties and application of zinc. It is a non-trading organisation supported by all the Empire producers of the metal. Its scope has been greatly extended by the formation of the Zinc Alloy Die Casters Association (1941) and the Zinc Pigment Development Association (1943). An experimental

workshop has been established at Oxford, to assist the development of new uses of sheet zinc in the building industry. All the Association's services are conducted free of charge.

The Association is represented on various British Standards Institution Committees and maintains a close liaison between various Government departments dealing with the use of non-ferrous metals. It has also participated in the recent Government sponsored industrial visits to European countries.

ZINC ALLOY DIE CASTERS ASSOCIATION

This Association, which comprises the great majority of zinc alloy die casters in this country, spreads information on the uses and properties of zinc alloy die castings, with the object of increasing the use of die casting. A Technical Committee, whose investigations cover all aspects of die casting, prepares reports and gives free technical advice. A Publications Committee prepares technical books and distributes the material compiled by the Technical Committee. An advertising campaign is being conducted in the technical press.

ZINC PIGMENT DEVELOPMENT ASSOCIATION

This Association includes the British manufacturers of zinc oxide and lithopone and aims at disseminating knowledge of properties and uses of zinc pigments. A Technical Committee is surveying existing information on the subject and preparing material for publication in the technical press. Practical tests are being carried out in different parts of the country to ascertain the weathering properties of various zinc pigment mixes. The Association is represented on the British Standards Institution committees which consider pigments and paints. Publications are now being issued and an advertising programme prepared.

Additional activities of these Associations include lectures, loan of films, and slides, the preparation and display of models and specimens, and general publicity. Activities covering the publication of books, lectures, demonstrations and the preparation of new films are being increased to meet an ever growing demand.

PROFESSIONAL AND LEARNED SOCIETIES

Association of Scientific Workers

15, Half Moon Street, London.

Telephone : Grosvenor 4761.

President : Professor P. M. S. Blackett, M.A., F.R.S.

THE Association of Scientific Workers is a trade union, whose objects include: The protection of the economic interests of its members; the improvement of the status of the scientific profession; the securing of the wider application of science and the scientific method for the welfare of society; and the improvement of scientific and technical education.

At the end of 1944 the Association had 16,250 members, of whom about half are employed in industry, about one-fifth in the Civil Service, the

remainder being in universities and in agricultural and medical research institutes, etc. The members are organised into branches, of which there are about 170. The branches are grouped into 11 areas. Once a year every branch sends delegates to the Annual Council Meeting. The Executive Committee of the Association, which meets monthly, consists of a delegate from each area, and four officers and nine ordinary members elected at the Council Meeting.

Membership of the Association is open to qualified scientists and engineers (Full Members); those engaged on scientific or technical work but not fully qualified (Associate Members); and full-time science or engineering students (Student Members).

The Association is affiliated to the Trades Union Congress, to the Parliamentary and Scientific Committee, and to the Confederation of Shipbuilding and Engineering Unions. Many of its branches are affiliated to trades councils.

The activities of the Association are carried out through its branches, area committees and Executive Committee, with the assistance of full-time officials. Sub-committees are appointed by the Executive Committee to cover the interests of particular groups of members (*e.g.* engineers, medical scientists, university staff, etc.) or to deal with particular aspects of the Association's work (*e.g.* education, publicity).

The activities of the Association include negotiations with employers regarding economic conditions; provision of legal assistance to members; an employment bureau; an information service to members; study of the relations between science and social development; preparation of memoranda and proposals for improvements in the finance and organisation of science; evidence to commissions of inquiry dealing with matters relating to the development and use of science; publicity for science through press, film and radio; propagation of the Association's policy, as developed by discussions and the collection of facts, on the future of science and scientific education; publication of a *Journal*.

The growth of membership from 1,200 in 1939 to over 17,000 at the present time has also called for considerable attention to internal organisation.

The Association holds that it is necessary for a national plan to be made for the advance of scientific research so that the country's scientific resources may be directed into those channels which will bring the best results in the relief of poverty, the provision of adequate food, housing and medicine for the community, the most efficient use of natural resources, and the general raising of the standard of living for the peoples of the world.

Atomic Scientists Association

President : Professor N. F. Mott, F.R.S., The University, Bristol, 8.

Secretary : Professor P. B. Moon, Physics Department, The University, Birmingham, 15. Telephone : Selly Oak 1181.

THE aims of the Association are :

- (1) To provide a forum for the discussion among scientists of the scientific, social and international problems arising out of the release of atomic energy.

(2) To keep these problems before the public and to press for a positive political programme for their solution.

(3) To disseminate and explain published material on atomic energy and particularly on its implications, both to other scientists and to the general public. Also to provide for an agency for the countering of misleading statements.

(4) To make and maintain contact with scientific and other bodies in this country with whom some aim is held in common.

(5) To form and maintain a library of books, papers, and other publications relating to the aforementioned objects.

General information may be obtained from the Secretary; inquiries regarding membership should be addressed to the Membership Secretaries, Dr. N. Kurti and Dr. G. O. Jones, Clarendon Laboratory, Parks Road, Oxford.

British Association for the Advancement of Science

Burlington House, London, W.1.

Telephone : Regent 2109.

President : Sir Henry Dale, O.M., G.B.E., F.R.S.

THE British Association for the Advancement of Science was founded in 1831 "to obtain more general attention for the objects of science" and for other purposes designed to promote scientific inquiry and intercourse between scientific workers both at home and abroad. It has done this principally by means of great annual meetings in a succession of cities of the United Kingdom and, at intervals since 1884, in the Dominions. Inasmuch as the Association avowedly contemplated no invasion of the ground occupied by the other great learned societies whose headquarters are in London, these annual meetings were never held in London, except in 1931, when the centenary was celebrated there. Meetings have been held annually except during two years of the first world war and the whole of the second. The first full post-war annual meeting will be held in Dundee from 27th August to 3rd September, 1947. At the annual meeting a large number of communications are given at sectional meetings, and the presidential address to the whole meeting has come to be regarded as one of the principal scientific pronouncements of the year. The Presidency of the Association, which is an annual office, is regarded as a high scientific honour.

There are 13 Sections, which meet concurrently. Several of these have obviously close relationships with industry—for example, those of Physics, Chemistry, Engineering, Economics—and to these may be added, consistently with modern developments, those of Geology and Psychology. In the programmes of all these Sections communications relating to industry are usual features.

From an early stage the Association devoted such funds as it accumulated to the advancement of science through research, and in addition to this a vast amount of voluntary work has been done by way of inquiry into "the state of science" in various departments, and in the preparations of reports. By these means many scientific investigations of the highest importance have been set on foot. For example, work by Association committees

leading up to the establishment of international electrical standards extended over the last 40 years of the 19th century. Exhaustive reports on colloid chemistry were published in 1917 and subsequent years ; in the 80's of the last century committees of the Economic Section investigated various questions of wages ; in 1905 the accuracy and comparability of British and foreign statistics of international trade were studied ; during the war of 1914-18 an investigation into the replacement of men by women in industry was carried out ; and after that war, authoritative reports on British finance and British labour were published.

A Division for Social and International Relations of Science was established in 1938 with the general object of promoting public understanding of the benefits of science to the community and to mankind at large. It was empowered to hold conferences at times and places other than those of the meetings of the whole Association, with the idea that such conferences might be held in towns not large enough to receive a full annual meeting. When the war made it impossible for the annual meetings of the Association to be held, the Division was able to hold conferences, which it did in London. They began with one on *Science and World Order*, which brought together a large number of leading scientists, statesmen and others, both British and foreign, qualified to present authoritatively some of the problems of settlement after the war towards which science could powerfully contribute. Out of this conference a number of subjects emerged which were pursued through further conferences and committees. In this manner important contributions have been made to the investigation of such matters as European agriculture ; mineral resources and the Atlantic Charter ; science and the citizen ; post-war university education ; and the place of science in industry. This last conference, specially noteworthy in the present connection, brought together leading statesmen, industrialists, and scientists, and their contributions were published in *The Advancement of Science*, No. 10 (May 1945). In the same issue a start was made with a series of articles on scientific subjects of general public interest, including topics with industrial applications, and these articles will be issued in pamphlet form, separately, as soon as circumstances permit.

British Institution of Radio Engineers

9, Bedford Square, London, W.C.1.

Telephone : Museum 1901.

President : Rear-Admiral the Viscount Mountbatten of Burma, K.G., G.C.V.O., K.C.B., D.S.O., A.D.C., LL.D., D.C.L.

FOUNDED in 1925 and incorporated in 1932, the Institution is a professional body existing solely in the interests of the radio and electronic engineer.

Examples of research work are exemplified in the Institute's monthly meetings. Moreover, the programme of the 1947 Convention of the Institution (held in May) indicates the wide scope of radio activity (apart from communications) which justifies further research, e.g. air, rail and sea navigation, industrial and mechanical electronic controls, etc.

The wide ramifications of radio, now applied as a means of improving the lot of the citizen in the world at peace, make it essential that the technical

status and professional interests of the radio and electronic engineer must be the concern of a body which caters solely for his needs in promoting the advancement of radio research and the science of electronics generally.

The Institution recommends the formation of a British Radio Research Institute and to this end has submitted a proposal to the radio industry and the Government, as a contribution towards post-war prosperity. A brief summary of the recommendations is given below.

This Report, prepared by a committee formed in 1943 and published in January 1944, states that research will have to be undertaken on a scale greater than was contemplated in the pre-war era, and must be free from financial limitations. Government participation in the work and direction of research is considered to be essential, while the proposed Radio Research Institute would provide liaison with other related industries.

The Institution recommends that the function of the Research Institute should be the pursuit of basic research, hitherto restricted owing to its cost and the absence of immediate practical applications or early financial return. It is proposed that finance be provided by industry's subscriptions and an equal Government grant, while its work would be directed by an impartial Board. There would be a permanent qualified scientific staff, supplemented by extra-mural workers. Progress reports, published regularly, would be accessible to all interested bodies.

The practical and industrial applications of the results of research would be the province of private enterprise, and the need for separate research departments associated with individual firms would be enhanced. The work of existing Government research establishments would not be duplicated or encroached upon.

It is estimated that a contribution from industry of one quarter of 1 per cent. of turnover would give, together with a Government grant, an income comparable with that of other research associations.

It is believed that such an Institute could also meet the need for collaboration between the countries of the British Commonwealth in radio research.

The Secretary is G. D. Clifford, F.C.C.S.

British Sound Recording Association

Temporary Address : BCM-BSRA, London, W.C.1. Tel. Primrose 3269.

President : L. E. C. Hughes, Ph.D., B.Sc., A.M.I.E.E.

THE British Sound Recording Association was formed in 1936 by a group of electro-acoustic engineers and amateur technicians with the primary purpose of uniting, in one organisation, all persons, particularly, but not exclusively, in Great Britain, engaged or interested in the art and science of sound recording, either professionally or as amateurs. It is in no sense a trade association.

In pre-war years B.S.R.A. membership extended to South Africa, Australia, U.S.A., etc., and included many professional film and disc recordists, as well as a large number of amateur enthusiasts interested in direct recording and sub-standard sound-film work.

The main objects of the Association are for members (*a*) to meet for discussion on all aspects of sound recording and reproduction by all known or proposed methods; (*b*) to conduct experiments and research in the aforementioned methods; (*c*) to hold lectures, demonstrations and exhibitions; (*d*) to visit places of interest; and (*e*) mutually to assist each other by the interchange of ideas and experiences, and by collecting and disseminating technical and other information in the form of an Association *Journal* and other publications.

The B.S.R.A. maintains an Information Bureau and issues publications.

The widespread and increasing interest by technicians and the public in sound recording and its applications demands an active organisation, devoted specifically to this subject, and the B.S.R.A. exists to supply these facilities and promote high standards in the professional side of sound recording.

The Hon. Technical Secretary and Editor is D. W. Aldous, F.R.S.A., M.Inst.E., and applications for membership should be made to the Hon. General Secretary, R. W. Lowden, A.I.R.E., A.S.M.P.E.

Chemical Council

Conjoint Chemical Office, 9-10, Savile Row, London, W.1. Telephone: Chairman : Professor E. K. Rideal, M.B.E., D.Sc., F.R.S. Regent 2714.

THE Chemical Council was founded in 1935 by the Chemical Society, the Royal Institute of Chemistry, and the Society of Chemical Industry, for the purpose of promoting the general welfare of the societies and of increasing the service they give to their members and to the science of chemistry.

It has collected a considerable sum from individual chemists and from the chemical industry through the Association of British Chemical Manufacturers and other associations interested. This money is used to assist the societies to maintain and improve their publications and to assist the library of the Chemical Society to give better facilities to chemists and through them to the chemical industry.

Other societies can be admitted to membership of the Chemical Council on the recommendation of the Council and with the approval of each of the constituent founder-bodies. The Society of Public Analysts and other Analytical Chemists has recently asked to be admitted and has been invited to nominate two representatives. The Chemical Council now consists of: 4 members nominated by the Chemical Society; 4 by the Royal Institute of Chemistry; 4 by the Society of Chemical Industry; 4 by the Association of British Chemical Manufacturers; 2 by the Faraday Society; and 2 by the Society of Public Analysts and other Analytical Chemists.

The Council has brought about closer collaboration between the societies, which has resulted in the establishment of a joint subscription scheme with special terms for junior members, and a more economical distribution of publications. It also financially assists the publishing societies to improve and expand their publications.

Chemical Society

Burlington House, Piccadilly, London, W.1. Telephone : Regent 1675.
President : Professor C. N. Hinshelwood, Sc.D., F.R.S.

THE Chemical Society, of which H.M. The King is Patron, was founded in 1841, and received its first Royal Charter in 1848. It is the oldest Chemical Society in the world.

The main function of the Society is to foster original research in chemistry and to facilitate the discussion and dissemination of new knowledge in all branches of the science. This it does by arranging meetings in the Society's Rooms and in local areas through its local representatives; by publishing in its *Journal*, *Quarterly Reviews* and *Annual Reports* the results of investigations covering the whole field of pure chemistry; by means of its extensive reference and lending library; and also by making grants from its Research Fund to assist research in pure chemistry.

Fellowship is open to men and women of all nationalities interested in chemistry who wish to keep in touch with its advances.

The Society is governed by a Council consisting of the President, Vice-Presidents (12), Treasurer, Honorary Secretaries (3), *Ex-officio* Members (4), Ordinary Members (21), and co-opted members (not exceeding 2). The Officers and Council are elected by ballot by Fellows, the Ordinary Members of Council being elected on a basis of territorial representation.

Chemists may become joint members of the Chemical Society, the Royal Institute of Chemistry, the Society of Chemical Industry and the Faraday Society. Inquiries in this respect should be sent to the Conjoint Chemical Office, 9-10, Savile Row, London, W.1.

Faraday Society

6, Gray's Inn Square, London, W.C.1. Telephone : Chancery 8101.
President : Professor W. E. Garner, F.R.S.

THE Faraday Society was founded in 1903, primarily to promote the study of electrochemistry and electrometallurgy. In course of time, however, its work has expanded to cover the whole field of pure and applied physical chemistry. Physical chemistry has been interpreted in its broadest sense to include colloid chemistry and numerous "borderland" subjects which lie between physics, chemistry, biology, engineering and metallurgy. Papers read and discussed before the Society deal also with the physico-chemical aspects of specialised branches of science and technology. The bringing together of men engaged in work of so varied a character as to make it possible to hold discussions of this nature (outside the scope of the more specialised societies) is a special phase of activity.

The General Discussions organised by the Society have attained a world-wide reputation. They have a fourfold purpose: To secure a survey of the subject under review from every possible angle; to focus general interest in the subjects with a view to its more extended consideration or application; to afford an opportunity of bringing forward new material for appreciation and criticism under the most stringent and favourable conditions; and to

suggest new lines of investigation and advance. These discussions are in peacetime largely attended by distinguished men of science from all parts of the world. A special feature of the meetings is that all papers for discussion are issued in advance proof some days before each meeting, so that the whole time of the meeting may be devoted to considered general discussion. Apart from the value of the papers discussed, an important feature of these meetings is the opportunity provided for workers to discuss their problems, either in full meeting or during the intervening social functions.

The papers submitted for discussion and a report of the remarks made by speakers during the meeting are published in the *Transactions* in the ordinary way as soon as possible after the meeting and a reprint of the whole is also available for purchase.

The Society invites the co-operation of all physical chemists and others interested in the above-mentioned branches of science.

The Hon. Secretary is G. S. W. Marlow, B.Sc., F.R.I.C.

Glass Delegacy of the University of Sheffield

Department of Glass Technology, The University, "Elmfield," Northumberland Road, Sheffield, 10.

Telephone : Broomhill 62467.

Chairman : Dr. S. B. Bagley, F.S.G.T.

THE Glass Delegacy was formed to supervise the work and to safeguard the welfare of the Department of Glass Technology of the University of Sheffield, and, in particular : To make such arrangements for the teaching and training of students in glass technology as the University may from time to time prescribe for a Degree or Diploma ; to encourage and assist in the development of technical training in glass technology throughout the United Kingdom ; to conduct researches in the fundamental principles of all branches of glass technology ; to carry out tests and researches in all branches of glass technology for persons, firms and corporate bodies ; and to assist in the technical development of the glass industry by such other means as the Delegacy may from time to time approve.

Membership consists of persons appointed by the Council of the University, representatives of educational bodies, guilds, industrial associations, research organisations, and representatives of all subscribing firms.

The Delegacy is financed to the extent of approximately three-quarters by direct contributions from manufacturing firms, and the remainder by the University and by grants from various bodies. Its approximate income in 1945 was £15,000.

The present buildings of the Department of Glass Technology, of which Professor Harry Moore, D.Sc., A.R.C.S., F.Inst.P., F.S.G.T., is the Head, were erected in 1937-39 with funds provided by the glass industry. They constitute a separate block of the University buildings, with administrative offices, library, lecture-rooms, museum, a considerable number of separate research laboratories for special purposes, workshops and a large glass-melting operations section. The Department is thoroughly equipped to carry on researches and testing work in all branches of glass technology.

The Delegacy issues publications including some 500 reports on experimental researches and surveys printed in various technical journals.

Inquiries should be sent to the Secretary, Dr. A. W. Chapman, F.R.I.C., at the Glass Delegacy, The University, Western Bank, Sheffield, 10.

Institute of Brewing

Temporary Address : The Goring Hotel, Grosvenor Gardens, London, S.W.1.

President : Walter Scott

Telephone : Victoria 8211.

THE Institute, originally known as the Laboratory Club, was founded in 1886 and has been known under its present title since 1890. Armorial bearings were granted in 1937.

The Institute is the technical and research association of the brewing industry. Its objects are *inter alia* : To promote such arts and sciences as are, or may be capable of practical application to the fermentation industries ; to promote and encourage scientific education, investigation and research ; to provide facilities for the acquisition and dissemination of information relevant to these industries, and, for such purposes, to publish and issue a *Journal or Journals*.

There are five classes of membership, *viz.*, Student Members, Ordinary Members, Associate Members, Diploma Members and Corporate Members.

There are six Sections of the Institute with headquarters in London, Manchester, Leeds, Birmingham, Edinburgh and Burton-on-Trent respectively. Monthly meetings are held at these centres for the discussion of papers of interest to the fermentation industries, and the papers and discussions are published in the *Journal* of the Institute of Brewing, issued every other month.

THE RESEARCH SCHEME. Since 1920, the Institute of Brewing Research Scheme has been financed by the annual subscriptions of Corporate Members. The fund so formed, which is at the disposition and under the control of a Research Fund Committee appointed by the Council, has been applied and used in promoting and assisting scientific investigations and research for the benefit of the fermentation industries generally.

The brewing industry in 1946 made additional provision for the annual expenditure of a large sum of money on research, and has entrusted the expenditure of this money to the Institute of Brewing.

A Central Research Station is visualised and will be constituted as soon as a convenient site, in the neighbourhood of London, is obtained, and the permits for building, or alterations to existing buildings, are forthcoming.

This Establishment will consist of chemical, physical and microbiological laboratories as well as specialised laboratories working in conjunction with the experimental maltings and brewery of the Institute and the Hop and Barley Stations in which the Institute is interested.

Inquiries should be sent to the Secretary, W. H. Bird, F.C.I.S.

Institute of British Foundrymen

St. John Street Chambers, Deansgate, Manchester, 3.

President : D. Howard Wood

*Telephone :
Blackfriars 6178.*

THE Institute of British Foundrymen was established in 1904 as the British Foundrymen's Association, and changed its title to the Institute of British Foundrymen in 1921, when it was incorporated by Royal Charter. At the time of its foundation, the production of castings was dependent solely upon craft skill and "rule of thumb" methods, but since that time, largely through the activities of the Institute, the scientific and technical principles involved in the production of sound castings have received much wider recognition throughout the industry.

Close relations are maintained with overseas Foundry Associations through the International Committee of Foundry Technical Associations, the Secretary of which is the Secretary of the Institute. International exchange of technical information is also fostered through the system of annual "exchange papers," arranged between the Institute and kindred foreign organisations, inaugurated in 1921.

The Institute which has a membership of almost 4,000 has established 12 branches and 7 sections throughout this country and in South Africa, and has a growing membership in India, Australia, New Zealand and other industrial countries of the world. Approximately 120 branch meetings are arranged each year in this country for the presentation and discussion of papers, and every year a number of works visits are arranged by each branch. In addition an Annual Meeting of two to three days' duration is held in London or a provincial centre, when a number of further papers are presented for discussion. The annual volume of *Proceedings* and other publications are issued to members of the Institute.

The technical activities of the Institute are under the control of the Technical Council which has at present about 12 active Sub-Committees investigating various technical matters of importance to the industry. The Technical Council does not, however, engage in any primary research, which is carried out principally by the British Non-Ferrous Metals Research Association, and the British Cast Iron Research Association, with whom friendly and reciprocal relations exist. One of the principal functions of the Technical Council is the interpretation of primary research for industrial purposes.

During the war, the Institute has maintained close touch with a number of Government departments interested in the use of castings and in other aspects of the industry. Particular mention may be made of the Central Register of the Ministry of Labour and National Service, Ministry of Supply, Ministry of Aircraft Production, Ministry of Education and Ministry of Fuel and Power. The Secretary is T. Makemson, M.B.E.

Institute of Fuel

18, Devonshire Street, London, W.1.

President : Dr. C. E. Lander, C.B.E.

Telephone : Welbeck 4124.

THE Institute of Fuel was founded in 1927 as a Company limited by Guarantee. In 1944, amendments to the Articles of Association provided for conduct of its affairs in a manner similar to that of a Chartered

Institution. It formulated, and agreed with the City and Guilds of London Institute, an education scheme for the examination and certification of fuel technologists. The provisions of this scheme, with further requirements of adequate experience, form the basis of admission to the Institute since the Royal Charter was granted in 1946.

The Institute consists of: Honorary Members; Fellows; Members; Associate Members, who are corporate Members; Associates; Students; and Collective Members (with their Representatives), who are non-corporate Members. The total membership at November 1946 was 2,855.

The Institute has the following Sections: North-Western (with a Merseyside Sub-Section); East Midland; Midland; Yorkshire; Scottish; North-Eastern; South Wales; and London. There are also numbers of overseas members.

Public meetings (usually in the evening) are held monthly, at places specially announced, in London and in other Sections from September to May. A *Journal* is published by the Institute.

The Founder President, the first Lord Melchett, in 1930 presented a sum for establishment of the *Melchett Medal* awarded each year regardless of membership or nationality, to one who in the opinion of the Council has made available the results of outstanding work in fuel. The Melchett Lecture is delivered annually and published in the *Journal*. A Students' Medal with a prize of £5 has also been established by the Council.

Institute of Metals

4, Grosvenor Gardens, London, S.W.1.

Telephone : Sloane 6233.

President : Col. P. G. J. Gueterbock, C.B., D.S.O., M.C., T.D., D.L., M.A.

THE Institute of Metals was founded in 1908 with the object of promoting the science and practice of non-ferrous metallurgy in all its branches and of assisting the progress of discoveries and inventions likely to be useful to its members and industry in general. It is international both in its membership and its activities, and affords a means of communication on matters of mutual interest between those engaged in scientific investigation, production and manufacture, and industries making use of non-ferrous metals in all parts of the world.

Membership is open to those interested in any branch of metallurgy, regardless of nationality. Members must either be engaged in the production, manufacture, working or use of metals and alloys, or have scientific, technical or literary attainments connected with the metal trades or the application of metals and alloys, or be engaged in their scientific investigation. Student members, as the name implies, must be either students of metallurgy or pupils or assistants of persons qualified for ordinary membership, whether such persons are members of the Institute or not.

The Institute is governed and administered by a Council, which is representative of the several groups in its membership; it includes the Chairman of all the Local Sections (*see below*). Having regard to the considerable overseas membership, the Council has appointed Corresponding Members in a number of the Dominions and foreign countries,

through whom it is able to keep in closer touch with local matters of interest.

A feature of the organisation of the Institute is the existence of active Local Sections in each of the principal centres of the industry in Great Britain ; at present there are five of these with headquarters respectively in Birmingham, London, Glasgow, Sheffield and Swansea. These bodies organise their own activities and meetings. Further, the Institute has entered into association with the Manchester Metallurgical Society and co-operates with it in meetings in the Manchester district. Membership of Local Sections is free to all members of the Institute.

The Institute holds three main general meetings each year, the Annual General Meeting in London in the Spring, May Meeting (at which the May Lecture is delivered), and the Autumn Meeting in the provinces or abroad later in the year. Further general meetings are also organised at other times of the year as may be required. At these meetings papers on scientific and technical subjects are read and discussed, and visits are paid to works and other places of scientific and metallurgical interest. Each year a person of outstanding eminence in the scientific world is invited to deliver the *May Lecture* in London, and in connection with the Autumn Meeting a special lecture is given on a subject of particular interest to the centre where the meeting is held.

In recognition of outstanding services to the non-ferrous metals industries, whether on the scientific or practical side, and without distinction of race or country, the Institute, through the generosity of the Mond Nickel Company, Ltd., makes an annual award of a platinum medal, known as the *Institute of Metals Medal*.

The Institute issues a *Journal* and other publications, maintains an Information Service and (with the Iron and Steel Institute) a joint library.

Inquiries should be sent to the Secretary, K. Headlam-Morley.

Institute of Patentees

25, Victoria Street, London, S.W.1.

Telephone : Whitehall 1616.

President : Professor A. M. Low, A.C.G.I.(Lond.), M.I.A.E., F.C.S.,
F.R.G.S., F.I.Arb., F.F.Sc.

THE Institute of Patentees is a public body formed to give inventors of all classes unbiased technical advice on any idea and information appertaining to Patent protection of their rights and interests ; to introduce them to Industry in all countries through the unbiased channels of correspondence, interview and exhibitions ; and to carry out any financial transactions necessary.

Exhibitions in more than one industrial centre per annum could create competitive strength for invention, enliven active interest in industry, and ensure quicker and more practical offers of production and sale.

The Institute can also assist commercial firms by providing information on new ideas at the time of provisional protection in Great Britain and foreign countries. Special advice on Patent Law, preliminary search of the Patent Offices and legal action can be carried out economically. Cases of infringement can be solved and information in regard to taxation on Patents obtained.

A News Sheet is published, but a return to a periodical will be made as soon as economically possible.

A commission of 5 per cent. on profit is claimed after acceptance by industry of an invention through the Institute.

The Hon. Secretary is Sir Arrol of Moir, Bt., B.A., M.Inst.C.E.

Institute of Physics

47, Belgrave Square, London, S.W.1.

Telephone : Sloane 9806.

President : Professor A. M. Tyndall, D.Sc., F.Inst.P., F.R.S.

THE Institute of Physics was founded in 1918 and incorporated two years later. Its objects are broadly the advancement and diffusion of a knowledge of physics and its application in industry, and the elevation of the profession of physicist. The following Societies, known as Participating Societies, are specially associated with the work of the Institute and are directly represented on the Board: the British Institute of Radiology, incorporated with the Röntgen Society; the Faraday Society; the Physical Society; and the Royal Meteorological Society.

The Institute provides for (a) Members, in whom alone authority is vested, consisting of Honorary Fellows, Fellows and Associates, (b) Subscribers, and (c) Students. The diplomas F.Inst.P. and A.Inst.P. imply a high standard of professional competence in physics. The qualifications required for Associateship are a degree in physics (or proof of equivalent knowledge), following an approved course of study together with suitable professional experience. Fellowship is normally awarded only to those who, after an approved training, have obtained a degree in physics with first or second class honours and have had at least five years' full-time approved experience in the practice of the profession. Copies of the regulations may be obtained from the Institute.

The Institute's diplomas have been recognised by the principal Government departments and authorities both at home and overseas. The Institute is the recognised organisation for consultation on all matters affecting physicists and the practice of the profession.

A panel of consulting physicists and a register of physicists who are available for employment are kept at the offices of the Institute. The Institute is prepared to advise public departments and research laboratories requiring the services of physicists.

Conferences on industrial physics are held from time to time under the auspices of the Institute. Periodical summer schools are arranged in order to provide an opportunity for Members to obtain information on some of the recent advances in pure and applied physics, especially those likely to be of importance to the practising physicist.

The Australian Branch of the Institute has Divisions in the different States of the Commonwealth; there is also a Branch of the Institute in India. The following are the Home Branches: London and Home Counties; Manchester and District; Midland; Scottish; and South Wales. These Branches arrange symposia, lectures, discussions, visits to

works and laboratories, and so forth. To meet the demand for opportunities for the interchange of knowledge and experience between those engaged on similar work in widely differing industries and in the universities and technical colleges, there exist Subject Groups, as follows: Electronics, Industrial Radiology, X-Ray Analysis, Industrial Spectroscopy and Electron Microscopy. These hold periodical meetings and conferences.

Laboratory and technical assistants who reach a satisfactory standard in physics and practical mathematics, simple wood- and metal-work, glass-blowing, and laboratory organisation and technique are awarded the Institute's Laboratory Arts Certificate. Copies of the regulations governing the award of this certificate will be sent on request.

The Institute in conjunction with the Ministry of Education awards National Certificates in Applied Physics. The courses are normally part-time ones conducted at technical colleges and, while leading to a well-recognised qualification, are particularly designed to be closely related to local industries. The course for the Ordinary National Certificate is intended to lead to that for the Higher National Certificate which, subject to certain conditions, will be accepted by the Board of the Institute as satisfactory evidence of the knowledge of physics demanded for Associateship.

The *Journal of Scientific Instruments* is a monthly publication dealing with the principles, construction and use of scientific instruments and with the applications of physics in industry. It is produced and published by the Institute, with the co-operation of the National Physical Laboratory. Fellows and Associates may receive the *Journal* without additional payment, and Subscribers and Students may do so at greatly reduced rates. A series of lectures under the general title *Physics in Industry* has been published by the Institute.

The Institute, jointly with the Physical Society, maintains a small physics library at 1, Lowther Gardens, Prince Consort Road, South Kensington, London, S.W.7.

It also maintains a Benevolent Fund, the sole object of which is to help necessitous persons who are or have been Members of the Institute (whether subscribers to the fund or not), or their dependents. In exceptional cases grants may be made to physicists or their dependents who are not or who have never been members of the Institute.

Communications should be sent to the Secretary, Dr. H. R. Lang, F.Inst.P.

Institute of the Plastics Industry

Windsor House, Victoria Street, London, S.W.1. Telephone : Abbey 3895.
President : H. V. Potter, B.Sc., F.R.I.C., M.I.Chem.E.

THE Institute was founded in 1931, and is registered as a limited liability company. It promotes the cause of the plastics and allied industries by: Providing means of co-operation and technical and social intercourse between persons engaged or interested in the plastics and allied industries; arranging lectures on technical subjects and organising visits to works and other places of interest; awarding certificates and diplomas by examination or otherwise; organising a scheme for pupil-apprentices in the plastics

industry ; forming and maintaining a library of literature relating to plastics and allied subjects ; maintaining an Appointments Bureau for the benefit of members ; and co-operating in the establishment of a Benevolent Fund.

Membership is open to individuals engaged, directly or indirectly, in the plastics and allied industries.

The Institute is governed by a President, a Chairman of Council, an Honorary Treasurer, an Honorary General Secretary, and a Council consisting of 12 Ordinary Members chosen from the members by ballot, and two *ex officio* members appointed from each home section, the Overseas Section being represented by its Honorary Secretary.

The Institute at present is divided into nine sections, consisting of London and District Section, Midlands Section, North Western Section, North Eastern Section, Southern Section, Western Section, Scottish Section, Yorkshire Section and Overseas Section.

It will be seen that the control of the Institute is entirely in the hands of the members. The affairs of each section are managed by a local committee elected by the members attached to the particular section, and presided over by a local chairman. The work of the Council of the Institute is decentralised as far as possible by the delegation of such activities as education, apprenticeship, art scholarships, etc., to committees of Council, each committee having its own convenor. Inquiries should be sent to the Hon. General Secretary, James Taylor, B.Sc., F.R.I.C.

Institute of Refrigeration

Empire House, St. Martin's-le-Grand, London, E.C.1. Tel. : Monarch 7391.
President : Kenneth Lightfoot, O.B.E.

THE Institute of Refrigeration was founded under the title of *The Cold Storage and Ice Association* in 1900, and is the oldest national society of mechanical refrigeration in the world. Before it became an institution of qualified technical membership, this organisation bore the title of *The British Association of Refrigeration*, the conversion to institute status being made as from 26th March, 1944.

The aims of the Institute are stated in its by-laws as follows : " The object of the institute shall be the general advancement of refrigeration in all its applications, both in relation to the perfection of its methods and the extension of its services to the community. It shall be within the province of the Institute to provide means for communication between members and their interchange of views on matters of common interest ; to promote and encourage progress in the standard of administration of cold storage and ice undertakings ; and generally to advance the status of those engaged in the practice of refrigeration."

Sessional meetings of members are held throughout the autumn, winter and spring months, at which papers of industrial, engineering and scientific interest are read and discussed. *Proceedings*, containing the full text of papers and their discussion, are published periodically.

Membership consists of Members, Associate Members, Associates and Graduates. The Hon. Secretary is J. Raymond.

Institute of Welding

2, Buckingham Palace Gardens, London, S.W.1. Telephone : Sloane 9851.
President : A. Dwyson, M.Inst.C.E.

THE Institute was founded in 1923 and is a technical institution, whose functions are : To organise the exchange of information by means of lectures, publications, and a library and information service ; to establish standards of training and education in the interests of welding development ; and to co-operate in the promotion and co-ordination of research. The Institute works in close co-operation with the British Welding Research Association.

Membership, which is open to individuals, to companies and firms and to trade and educational associations, affords opportunities of contact with leading men in all branches of the industry ; of sharing in a common pool of information ; and of keeping abreast of the growth of technical knowledge. It offers, too, a chance to co-operate in projects of research, development, and education of far-reaching influence upon the efficiency and prosperity of welding. Membership consists of the following classes : Member ; Associate Member ; Industrial Corporate Member ; Companion Member ; Graduate ; Associate ; Student.

The Institute has the following branches : Birmingham ; East Midlands ; Eastern Counties ; Leeds and District ; Liverpool and District ; London (North) ; London (South) ; Manchester and District ; Plymouth ; Portsmouth ; N.E. (Tees-side and District) ; N.E. (Tyneside and District) ; Scottish (East) ; Scottish (West) ; Sheffield and District ; South Wales ; South Western ; Southampton ; Wolverhampton.

The Institute publishes quarterly *Transactions* and Technical memoranda and reports. The Secretary is G. Parsloe, B.A.

Institution of Automobile Engineers

12, Hobart Place, London, S.W.1. Telephone : Sloane 2191.
President : Frank G. Woollard

THE Institution of Automobile Engineers was established in 1906 at a time when the design and manufacture of British motor cars was entering upon a period of extremely active development and expansion. In its existence of nearly 40 years the I.A.E. can truly be said to have grown with the British motor industry and its membership has consistently included the leading engineers, designers and research workers of the industry. This is exemplified in a distinguished list of past-presidents which includes many men who have made outstanding contributions to technical progress in road vehicles. The first President of the I.A.E. was Colonel R. E. Crompton, who pioneered the use of motor vehicles by the Army.

The Institution has throughout shown a steady growth of membership (from 200 in 1906 to over 4,000 in 1945). Automobile engineers from all parts of the world are members, although of course the majority are resident in Great Britain. The Institution was granted a Royal Charter in 1938.

The functions of the Institution, as outlined in its Charter, are "to promote

the development of automobile engineering as applied to all forms of self-propelled and mechanically-propelled rail-less road vehicles and to facilitate the exchange of information and ideas thereon."

In striving for these objectives the chief activity of the Institution consists of holding meetings in London and various provincial centres at which technical papers are presented and discussed. These papers provide the main contents of a monthly *Journal*, circulated to all members, and are also printed (together with the discussions) in an annual volume, *Proceedings*. During the past 14 years the Institution has also been responsible for the general direction of co-operative research work, in laboratories situated at Brentford, where a great deal of valuable work has been done. Plans have now been completed to enable this important research project to be carried on as an independent unit.

Other major activities of the Institution are the holding of meetings in various centres throughout the country for the presentation and discussion of the papers published in the *Journal*; the advising of parents and guardians regarding training and apprenticeship of youths in the automobile industry; the finding of suitable candidates for vacancies on the technical staffs of the automobile manufacturers, etc.; the maintenance of a comprehensive library of works on automobile and allied subjects; and the organisation of graduates' branches for the benefit of trainees, etc., in the industry. At the present time the Institution has 11 senior centres and eight graduates' branches in operation in England, Scotland, Australia and New Zealand.

The Institution maintains friendly and reciprocal relations with its counterparts in allied countries, such as the Society of Automotive Engineers of the U.S.A. and the Société des Ingénieurs de l'Automobile of France.

The Secretary is Brian G. Robbins.

Institution of Chemical Engineers

56, Victoria Street, London, S.W.1.

Telephone : Victoria 6161.

President : H. W. Cremer, M.Sc., F.R.I.C.

THE Institution was founded in 1922 and among its objects are: The promotion of the science and practice of chemical engineering; its maintenance as a profession of high standing; the improvement of educational facilities therein; and the establishment of the Institution as a status-giving body. It acts in any permitted way to further the interests of the profession it represents, and to give assistance in the solution of problems.

It is designed to effect the establishment of definite standards of efficiency in chemical engineering and among chemical engineers, and holds itself ready to assist the public generally in any way that may arise.

Membership consists of corporate members in the grades of Members and Associate Members, and non-corporate members in the grades of Honorary Members, Graduates and Students.

ACTIVITIES. Conferences are arranged from time to time, as deemed desirable by the Council. Public lectures and monthly meetings for the reading of papers are arranged.

All members in the Graduate and Student classes become *ipso facto* members of the Graduates and Students Section. Meetings of this Section are held during the winter months.

In 1944 the North-Western Branch of the Institution was established, based on the Manchester area.

The Institution maintains a Reference Bureau and a library, and compiles a Consultants' Register. Publications include *Transactions* and a quarterly *Bulletin*.

EDUCATION. The Council of the Institution has issued a booklet on a *Scheme for a Degree Course in Chemical Engineering* to assist in the establishment of additional adequate courses of training in chemical engineering in universities and technical colleges.

The following medals are awarded: The *Moulton Medal* for the best chemical engineering paper of the year of a mature character read before the Institution and published in the *Transactions*, the author of which need not necessarily be a member of the Institution; the *Moulton Medal* (with prize of books) for the best paper of the year communicated to the Institution and printed in the *Transactions* (only Graduates and Students of the Institution are eligible); the *Osborne Reynolds Medal* to members who have rendered meritorious service for the advancement of the Institution; and the *William Macnab Medal* for the best set of answers submitted in the Associate Membership examination each year, provided a sufficiently high standard is reached.

Institution of Civil Engineers

Great George Street, London, S.W.1.
President: Sir William Halcrow

Telephone: Whitehall 4577.

THE Institution of Civil Engineers—the oldest engineering institution in the world—was founded in 1818 by a group of the younger engineers of the day, who decided “that a Society be formed consisting of persons studying the profession of a civil engineer.” In 1820, after Thomas Telford, the leading civil engineer of his day, had become the first President, it began steadily to expand until it now has 15,544 members, including 14 Honorary Members, 2,377 Members, 8,083 Associate Members, 37 Associates and 5,033 Students. The Institution was granted a Royal Charter in 1828 and a Supplemental Charter in 1922, under the by-laws of which Members and Associate Members are now styled “chartered civil engineers.”

The term “civil engineering” was defined in the Institution Charter as “the art of directing the great sources of power in nature for the use and convenience of man” and so the Institution has always embraced all branches of engineering and from the beginning has welcomed amongst its members all duly qualified engineers from all parts of the world. Today it is the civil engineer who opens up a country and provides and maintains the roads, railways, docks, waterworks, buildings, etc.

The Institution is primarily a learned society and incidental to that a qualification-granting body. Its most important functions are: Firstly, the dissemination of knowledge by such means as arranging for the reading of papers at meetings, the issue of a *Journal* to all its members and the upkeep of a technical library; secondly, the maintenance of high standards, educational and practical, for the admission of new members; and, thirdly, the prosecution of research and investigation. Members are

encouraged to contribute their knowledge and experience to the common stock of the profession.

In addition to Local Associations of members in Great Britain and Northern Ireland and also abroad, the Institution has formed a number of Engineering Divisions, at meetings of which members interested in a particular branch of engineering meet together and discuss papers. So far, six are functioning, namely, Divisions dealing with Road, Railway, Structural and Building, Maritime Engineering, Works Construction, and Airport Engineering. It is expected that in addition to meetings in London, meetings and visits will be held out of London, while another advantage is that Divisions give greater opportunity for the younger members to contribute papers and to take part in discussions.

Research has always been of interest to members, and the Research Committee, which carried out much important work before the war, has restarted its work. The general policy adopted is to invite other Institutions and bodies interested in any particular research to appoint representatives on the sub-committee carrying out the investigations. Publications include reports issued by the Post-War National Development Committee.

The Public Relations Committee has been responsible amongst its various duties for organising exhibitions like the "*Practical Planning*" Exhibition, whilst facilities are provided from time to time for exhibitions of interest to engineers, such as the "*Mulberry*" Exhibition, the "*Plan for Plymouth*" Exhibition, and the "*Greater London Plan*" Exhibition.

The Institution is engaged in many other activities which there is not space here to enumerate, such, for instance, as the drawing up of Codes of Practice for a number of subjects concerned with the profession, and it strives constantly to carry out its various functions, realising, as it does, the extent to which modern civilisation is dependent on the work of the engineer.

Inquiries should be sent to the Secretary, E. Graham Clark, M.C., B.Sc.

Institution of Electrical Engineers

Savoy Place, Victoria Embankment, London, W.C.2.

President : V. Z. de Ferranti, M.C.

Telephone :

Temple Bar 7676.

THE Institution of Electrical Engineers, founded in 1871 as the Society of Telegraph Engineers, was incorporated by Royal Charter in 1921.

The Institution is constituted to promote the general advancement of electrical science and engineering, and their applications ; to facilitate the exchange of information and ideas by means of meetings, exhibitions, publications, and the establishment of libraries ; and to give assistance for the promotion of invention and research in electrical science and engineering and related subjects.

As the representative body of British electrical engineers, the Institution has assisted the Government in such ways as co-operating with the Ministry of Education in the operation of the scheme for Ordinary and Higher National Certificates in electrical engineering (awarded to apprentices and others taking approved courses at technical colleges throughout the country) and in many special wartime courses for the training of electrical personnel ; also with the Ministry of Labour and National Service in the working of the Electrical Engineering Section of the Central Register.

Close contact has been maintained with the Ministry of Works, particularly in connection with the *Report on Electrical Installations* and in the preparation of *Codes of Practice for Civil Engineering, Public Works, Building and Constructional Work*.

Much of the Institution's work is done through committees of the Council. Others, such as Wiring Regulations, and Ship Electrical Equipment Committees, include persons outside the Institution and aim at the representation of all available interests and experience.

Important work is achieved in the holding of meetings, for the reading and discussion of papers. In addition to ordinary meetings, held monthly in London, there are informal meetings and meetings of the Installations, Measurements, Radio, and Transmission Sections of the Institution.

Local Centres and sub-Centres, existing in all important regions in the United Kingdom, provide also for meetings and discussions, as do also Students' Sections and Overseas Branches and Committees.

The Institution has prepared regulations for the safe and efficient wiring of premises for lighting, heating, and power, and for the electrical equipment of ships; and draft regulations for overhead electric lines, on behalf of the Electricity Commission. The Institution is also associated with the work of the British Standards Institution and of the International Electro-technical Commission.

A Committee set up in 1941 has considered post-war problems in electrical engineering, and has issued reports on such topics as education and training for engineers, the organisation of post-war electrical research, and electricity supply, distribution and installation.

The Institution maintains a library and publications include the *Journal* which is issued in three parts.

RESEARCH COMMITTEE

In 1945 the Council of the Institution approved the formation of a permanent Research Committee to replace the Post-war Planning Research sub-Committee set up in 1941. Its terms of reference cover matters connected with electrical research affecting the Institution, assistance in selecting and advising Institution representatives on external bodies connected with research, and the maintenance of a general survey of research policy within the Institution.

The promotion of invention and research in electrical science and engineering constitutes one of the main objects of the Institution as set out in its Royal Charter, and in 1913 a Research Committee was set up to co-ordinate and originate research in the electrical industry. By 1917 the Committee consisted of 22 prominent scientists and engineers, but in 1919 reconstruction took place and in 1921 the work of the Committee was handed over to the British Electrical and Allied Industries Research Association, to the funds of which the Institution contributes, as well as nominating representatives to its Council.

Experience during the war years confirmed that there is a definite need for some clearing-house for electrical research, through which those requiring information could be put in touch with likely investigators. The Institution's Research Committee provides a focus for all possible electrical research facilities, including those of public bodies, universities and private individuals. Its advent ensures that the general problems of electrical research

receive unbiased consideration, to the advantage both of the Institution and of the science which it represents.

Institution of Electronics

*24, Buckingham Street, Strand, London, W.C.2. Tel. : Temple Bar 6368.
President : L. E. C. Hughes, Ph.D., B.Sc.*

THE Institution was initiated in 1930 by scientists and engineers who were interested in the applications of high-frequency electricity, particularly in the field of telecommunications. The scope was ultimately widened to include all subjects which come under the general title of the science of electronics.

The membership is classified in the three divisions of physics, applied electronics and electrotherapeutics, but there is no essential segregation of the membership.

In August 1935 incorporation was granted by the Board of Trade under the title of the Institution of Electronics.

The objects of the Institution are : To promote information in the science of electronics and other scientific subjects, by lectures, discussions, examinations, loan of books, publication of papers and correspondence ; to hold meetings for reading, lecturing and discussing matters bearing upon the science ; and to form a library and to establish a representative journal for the publication of papers dealing with electronics.

The Institution is constituted of corporate members, *viz.*, Fellows, Members, and Associate Members, and non-corporate members, *viz.*, Associates, Subscribers and Students.

MANAGEMENT. This is vested in a Council of corporate members and the Honorary Treasurer and the Honorary Secretary of the Institution. The members of the Council (other than the Honorary Treasurer and the Honorary Secretary) are elected at the Annual General Meetings of the Institution.

BRANCHES. Activities centre on the two main branches, the London and the North Western, each of which has a Branch Committee elected by the branch members.

LECTURE MEETINGS. Lecture and discussion meetings, for which all members receive notice, are held in London and the Manchester district.

Inquiries should be sent to the General Secretary, Alexander H. Hayes (London Branch as above) or Leslie F. Berry (North Western Branch) 105, Birch Avenue, Chadderton, Lancs.

Institution of Engineers and Shipbuilders in Scotland

*39, Elmbank Crescent, Glasgow, C.2.
President : Allan Stevenson, C.B.E.*

Telephone : Central 5181.

THE Institution of Engineers and Shipbuilders in Scotland is one of the leading technical societies in Great Britain. Founded in 1857 for the encouragement and advancement of the science and practice of engineering

and shipbuilding and to facilitate the exchange of ideas among its members, the Institution welcomes to its meetings all who can contribute to the advancement of knowledge, and places on permanent record the experiences elicited in discussion. All branches of engineering—marine, civil, mechanical, electrical and locomotive—as well as shipbuilding and steel manufacture have due attention accorded to them in the *Transactions* of the Institution. A technical library is maintained by the Institution.

The session opens in October, and meetings are held fortnightly from then until the following April. From time to time summer meetings with kindred associations are held, either at home or abroad.

The papers read before the Institution and the discussions thereon are published in the *Transactions*.

Although the home of the Institution is in Scotland, the membership is world-wide, and any person of any nationality is eligible for membership, provided he has the necessary training and qualifications.

The Institution co-operates in educational and industrial research by appointing representatives to the committees of such bodies as the National Physical Laboratory, the Royal Technical College, Glasgow, and the ship classification societies, and it has also numerous representatives on standardisation committees. Reports from these representatives are published in the annual volume of *Transactions*. The Institution does not itself undertake research, but co-operates with others and has a Research Fund, from which grants are made both to research organisations and to individuals.

The Secretary is P. W. Thomas, B.Sc.(Eng.).

Institution of Gas Engineers

Gas Industry House, 1, Grosvenor Place, London, S.W.1.
President : George C. Pearson, O.B.E., M.I.C.E.

Telephone :
Sloane 8266.

THE Institution of Gas Engineers, which was founded in 1863 and incorporated by Royal Charter in 1929, is the oldest of the national bodies of the British gas industry. Its membership continues to show a steady increase and has recently passed the 2,000 mark. The many functions of the Institution may be classified as professional, educational and technical.

Membership of the Institution is confined, by the provisions of the charter and by-laws, to persons in the gas industry in possession of specific qualifications comprising both a standard of academic training and practical professional experience. Corporate Members of the Institution (Members and Associate Members) are designated Chartered Gas Engineers. The membership includes gas engineers from all parts of the British Empire and from foreign countries. All Chartered Gas Engineers were enrolled on the Central Register of the Ministry of Labour and National Service.

The Institution normally holds two meetings each year—the Annual General Meeting in June and the Autumn Research Meeting in November. At the latter, reports are presented and discussed of the work of the Institution's Technical Committees and of the investigations of the Gas Research Board. Other General Meetings are held from time to time.

Research and the accumulation and dissemination of technical information are important functions of the Institution of Gas Engineers. Most of the

former research activities of the Institution are now co-ordinated in the Council of the Gas Research Board, which has been incorporated and is officially associated with the Department of Scientific and Industrial Research. The Board was set up on the initiative of the Institution and, in collaboration with the Society of British Gas Industries, as a further development of the work previously controlled by the Institution's Research Executive Committee and as a means of extending and placing on a wider basis co-operative research within and on behalf of the industry.

In addition, the Institution of Gas Engineers has a number of standing Technical Committees, all responsible to the Council of the Institution, dealing with district heating, gas installations, codes of practice, lighting, gas works safety, gasholders, ammonia and effluents, meters, pipes, purifiers, and other technical matters concerning the gas industry.

The Institution co-operates with various committees of the Ministry of Works and with the Codes of Practice Committee in drawing up Codes of Practice for gas supply services and installations in consumers' premises. The first of these Codes are now in the Press.

The Institution has co-operated with the Fuel Efficiency Committee of the Ministry of Fuel and Power. This general co-operation has been developed by the setting up in each Civil Defence Region of Gas Engineering Advisory Boards. These Boards, whose activities are co-ordinated by a Committee of the Institution, are not only actively assisting in the drive for fuel economy but are also functioning as bodies of mutual assistance.

The Institution and the Gas Research Board, in addition to initiating and directing lines of research, have issued various specifications and reports, which have been of great practical value to the gas industry. The technical needs and advances of the gas industry are continuously under review by the Institution and the Gas Research Board, and close contact is maintained with research work and Research Associations dealing with allied subjects. The Secretary is W. T. K. Braunholtz, M.A., Ph.D., F.R.I.C.

Institution of Mechanical Engineers

*Storey's Gate, St. James's Park, London, S.W.1. Tel. : Whitehall 7476.
President : The Right Hon. Lord Dudley Gordon, D.S.O.*

FOUNDED in 1847 under the Presidency of George Stephenson, the Railway Engineer, the Institution of Mechanical Engineers has progressed steadily during 100 years and now has over 24,000 members.

In 1877 the headquarters of the Institution were moved from Birmingham to London, the present Institution building in Storey's Gate, St. James's Park being built in 1899 and extended in 1912. This contains the administrative offices, two meeting halls, committee rooms, and a library.

The growth of the practice of mechanical engineering and of the Institution's organisation by 1920 resulted in an extension of the Institution's activities by the formation of branches in the main geographical divisions of Great Britain, whose affairs are controlled by a local Branch Committee appointed by the members of the branch. The Chairmen of such branches are *ex officio* members of the Council of the Institution. There are now

nine branches in Great Britain and three overseas. In territories overseas where there are active engineering societies catering for mechanical engineers, the Institution has supported the national engineering society but has the assistance of local advisory committees or corresponding members in the conduct of its own affairs.

In 1930, H.M. King George V was pleased to confer a Royal Charter on the Institution, confirming it in its work for the advancement of mechanical engineering science and practice, and permitting its Corporate Members to use the title "Chartered Mechanical Engineer."

From its earliest days, the Institution attracted to it, and had the benefit of the services of, many of the most distinguished men in British mechanical engineering. Amongst its earliest Presidents were George and Robert Stephenson, Sir William Fairbairn, John Penn, Lord Armstrong, Robert Napier, John Ramsbottom and Sir William Siemens.

The Institution is entirely independent and is self-supporting by the annual subscriptions from its members, receiving no subsidy from the Government or from industry.

In the early days of the Institution, the papers were mainly concerned with new manufactures and methods of fashioning materials, descriptions of new kinds of machines and forms of prime movers. Gradually the subject matter was increased to cover the more theoretical aspects of mechanical engineering science, the properties of engineering materials and their testing.

In encouraging the advancement of engineering science, the Institution has attached great importance to stimulating research in its fields, and since 1879 has adopted a policy of conducting researches by its own committees or supporting individual workers in their own researches. In this way, it has been responsible for many notable advances in engineering science and, in particular, research was commenced in the following subjects at the under-mentioned dates: Riveted Joints 1879, Friction (bearing) 1883, Alloys 1889, Marine Engines 1889, Steam Engines 1905, Refrigeration 1912, Wire Ropes 1913, Hardness Tests 1914, Flow in Steam Nozzles 1914, Cutting Tools 1919, Marine Oil Engines 1922, Welding 1931, Pipe Joints for use under conditions of high temperature and high pressure 1932, High Duty Cast Iron 1937.

The Secretary is Dr. H. L. Guy, C.B.E., F.R.S., M.I.Mech.E.

Institution of Metallurgists

4, Grosvenor Gardens, London, S.W.1.

President : Dr. J. W. Jenkin

Telephone : Sloane 0061.

THE Institution of Metallurgists was incorporated under the Companies Act 1929 on 15th September, 1945 as a Company limited by Guarantee.

The objects of the Institution as set out in the Memorandum of Association are *inter alia* as follows: "To promote, encourage, advance and co-ordinate the study and science of metallurgy in all its aspects; to promote in every possible way the interests of and to maintain and enhance the status and prestige of metallurgists and to encourage scientists whose

main interests lie in metallurgy to become and to designate themselves 'metallurgists'."

Power is also taken to promote the better education of metallurgists ; to maintain a register of qualified members ; "to adopt any lawful means conducive to the setting up and maintenance of a high standard of professional conduct among metallurgists" ; and to collaborate with existing professional and scientific institutions including especially the Iron and Steel Institute and the Institute of Metals.

The Institution is controlled by a Council elected by members. Membership of the Institution will be confined to those who provide satisfactory evidence of professional competence, for which a high standard will be set. Entry will be by examination from which exemption may be obtained on production of evidence of other equivalent qualification. Members will be entitled to use the initials F.I.M. (Fellow), A.I.M. (Associate) and L.I.M. (Licentiate) according to the grade of membership to which they are elected. An announcement concerning examinations will be made in due course.

An Appointment Register is operated for the benefit of members and employers. Membership applications and inquiries should be addressed to the Registrar. The Secretary is K. Headlam-Morley.

Institution of Mining and Metallurgy

Salisbury House, Finsbury Circus, London, E.C.2. Tel. : Clerkenwell 4984.
President : G. F. L. Ayccock, M.C.

THE Institution of Mining and Metallurgy, founded in 1892 and incorporated by Royal Charter in 1915, has for its objects the advancement of the science and practice of mining in respect of minerals other than coal and of metallurgy in respect of metals other than iron ; and to afford a means of facilitating the acquisition and preservation of that knowledge which pertains to the profession of a mining engineer and metallurgist. The majority of its 2,200 members are professionally engaged overseas, in the British Empire and other countries.

Membership is by application to the Council, and the various classes of membership are governed by by-laws.

An appointments Register is maintained at the Institution for the convenience of those who wish to engage the services of mining engineers, metallurgists and economic geologists.

The *Bulletin* of the Institution appears monthly, and the volume of *Transactions* is published annually. A comprehensive library is maintained jointly with the Institution of Mining Engineers.

In addition to publishing papers and arranging discussions on technical advances, the Institution also takes an active interest in educational matters, questions relating to future supplies of metals and minerals, the state in relation to the mineral industry, and industrial health. A joint Conference with the Institution of Mining Engineers on silicosis and dust suppression in mines will take place in April 1947.

Inquiries should be sent to the Secretary, W. J. Felton, B.Sc.(Econ.).

Institution of the Rubber Industry

12, Whitehall, London, S.W.1.
President : H. W. Franklin

Telephone : Whitehall 5012.

THE Institution of the Rubber Industry was founded in 1921: To promote a better understanding between all branches of the industry; to afford a common platform for the discussion of problems of mutual interest; and to further the advancement of the education and status of the industry's scientific and technical personnel. For this purpose meetings are held monthly from September to April in the local sections in London, Manchester, Birmingham, Leicester, Preston, Scotland, the West of England and Southampton, when papers on the various aspects of the industry, including many on original research, are read by recognised authorities and followed by open discussions. The papers read before these meetings and the discussions on them appear in the official journal of the Institution, the *I.R.I. Transactions*. Papers communicated direct to the *Transactions*, on original research and other matters of interest to the industry, are also included. The Institution publishes also an *Annual Report on the Progress of Rubber Technology*.

The sectional meetings have been supplemented as opportunity offered by national conferences, joint meetings with other learned societies, and an International Conference in London in 1938. These wider activities will increase in the future. Membership is open to both firms and individuals connected with the industry.

Contests for the best *Essays* on various aspects of the industry, submitted by members of the Institution, are held annually. These are normally in two sections; one open to members under 25 and the other to members over 25. A *Gold Medal*, presented by the late Rt. Hon. Lord Colwyn, P.C., LL.D., F.I.R.I., is awarded annually for services of a highly outstanding nature to the industry.

The annual *Foundation Lecture* is held alternatively in Birmingham, London and Manchester. The General Secretary is Miss C. Carden.

Institution of Structural Engineers

11, Upper Belgrave Street, London, S.W.1. Telephone : Sloane 7128.
President : Professor H. J. Collins, M.Sc., M.I.C.E., M.I.Struct.E.

THE Institution of Structural Engineers was founded in 1908 and was incorporated by Royal Charter in 1934.

It is a professional society with a membership of approximately 4,600. Its activities are devoted to the promotion and general advancement of the science and art of structural engineering in any or all of its branches and to the exchange of information and ideas relating thereto amongst the members of the Institution and otherwise. Meetings are held for reading and discussing papers bearing upon structural engineering and relevant subjects, including the constitution, properties and use of materials.

There are eight branches of the Institution, seven of which are in Great Britain and serve the following areas: Lancashire and Cheshire; the

Western counties ; Yorkshire ; the Midland counties ; the South Western counties ; South Wales and Monmouthshire ; and Scotiand. Overseas, there is the Union of South Africa Branch. The Institution issues a journal *The Structural Engineer*, and other publications.

Examinations are held by the Institution twice a year. In connection with these the following awards are made : The *Andrews Prize* to the most successful candidate in the complete Associate-Membership examination ; the *Husband Prize* to the candidate who takes the complete Associate-Membership examination and obtains the highest marks in the paper on "Structural Engineering Design and Drawing," and the *Senior and Junior Wallace Premiums* to (a) the candidate taking the whole of the Associate-Membership examination who obtains the highest marks in the paper "Theory of Structures (Advanced)" and (b) the candidate obtaining the highest number of marks in the complete Graduateship examination.

Since 1943, the Institution has been engaged in the drafting of Codes of Practice for reconstruction purposes in conjunction with the Ministry of Works, and acts as convenor institution for Load-Bearing Superstructures and Earth Retaining Structures. These Codes of Good Practice are about to be published.

In addition, the Institution at the request of the Ministry of Works submitted a report on *Reinforced Concrete Structures* published by H.M. Stationery Office.

The Institution's Meeting Rooms and Library are at the above address.

Iron and Steel Institute

4, Grosvenor Gardens, London, S.W.1.

Telephone : Sloane 0061.

President : Dr. C. H. Desch, F.R.S.

FOUNDED in 1869 and incorporated by Royal Charter in 1899, the Iron and Steel Institute has as its aims the provision of "a means of communication between members of the iron and steel trades upon matters bearing upon their respective manufacture, excluding all questions connected with wages and trade regulations," and "the arrangement of periodical meetings for the purpose of discussing practical and scientific subjects bearing on the manufacture of iron and steel." The Institute is affiliated to a number of local metallurgical societies situated in the principal iron and steel manufacturing areas. An Iron and Steel Engineers Group has been formed to handle problems of iron and steel works engineering.

Membership of the Institute is open to (a) persons practically engaged in works where iron and steel is produced or worked and (b) persons of scientific attainments in metallurgy, or specially connected with the application of iron and steel. Membership is not confined to those of British nationality.

The Institute publishes a monthly *Journal*, and in conjunction with the Institute of Metals, operates a technical library and Information Service. The Institute holds two General Meetings annually as well as meetings of the Iron and Steel Engineers Group, and meetings arranged in conjunction with the local societies affiliated to the Institute. Papers presented to the Institute and discussions held at these meetings are published in the *Journal* or in *Special Reports*.

In order to stimulate the reading of papers of a practical character, the late Mr. Iltyd Williams, on his retirement from the Hon. Treasurership of the Institute in 1926, founded the *Williams Prize*. This is awarded annually by the Council to the author of that paper judged to be the best of this type published by the Institute during the year. The author must be a British subject regularly employed in a British iron or steel works and at the time of presenting the paper must occupy a position not superior to that of manager of any one technical department.

In 1873, Sir (then Mr.) Henry Bessemer created a small fund for the provision of a *Gold Medal* to be awarded at each Annual Meeting of the Institute. The *Bessemer Gold Medal* is awarded to individuals (members or non-members, British or foreign) whom the Council adjudge to have made valuable contributions to the science or technology of the manufacture or use of iron and steel; it is the highest honour the Institute bestows.

Research has played a big part in the Institute's efforts to advance scientific and technical knowledge. In 1901 the late Mr. Andrew Carnegie (Past President) presented a sum, subsequently increased to \$100,000, to form a fund, now known as the Andrew Carnegie Fund, from which the Council make grants in aid of researches in the metallurgy of iron and steel. Applicants for such grants must be under 35 and may be of either sex. The reports on these investigations are published by the Institute, and the best report of the year, if of sufficient merit, may gain for its author an *Andrew Carnegie Gold* or *Silver Medal*.

Since 1924 the Institute has helped the British Iron and Steel Federation to organise collaborative research. Up till the end of 1944, four major Research Committees were operated by the Institute jointly with the Federation. These joint Research Committees have now been taken over by the newly formed British Iron and Steel Research Association. The Institute operates as the major publishing agency for the Research Association and works in close collaboration with it.

The Institute, in collaboration with other metallurgical institutes, carries on numerous activities in connection with metallurgical education.

The Secretary is K. Headlam-Morley.

Joint Council of Professional Scientists

c/o The Institute of Physics, 47, Belgrave Square, London, S.W.1.

Telephone : Sloane 9806.

Chairman : Sir Clifford Paterson, O.B.E., D.Sc., M.I.E.E., M.Inst.C.E.,
F.Inst.P., F.R.S.

THE Joint Council of Professional Scientists was established in 1942 for the period of the national emergency, to voice the collective opinion of qualified men of science, when this seemed necessary, and to co-ordinate action in matters of common interest to scientists working in different branches. It was originally a joint committee of representatives of the Royal Institute of Chemistry and of the Institute of Physics, and was developed by the co-option of a botanist, a geologist, a mathematician and a zoologist, there being no corresponding professional bodies to represent those branches of science. The newly formed Institution of Metallurgists is now also represented on the Council.

In June 1943 the Council was responsible for the issue of a statement on *The Place of Scientists in the Community*. The views expressed were generally supported and given wide publicity in the lay and technical press, not only in Great Britain but also abroad. The Council has specially concerned itself with the resettlement of professionally qualified men of science after the war and with the various proposals which have been put forward for the proper utilisation of their services. At the invitation of the Ministry of Labour and National Service, representatives of the Council gave evidence before the Ministry's Committees, the one on Higher Appointments and the other on Further Education and Training of Demobilised Persons. Through the Joint Council, also, the Royal Institute of Chemistry and the Institute of Physics offered their continued co-operation with the Ministry in the resettlement period. The Council is also prepared to assist in the general resettlement of all who earn their living through their knowledge of any branch of natural science. With the approval of the Council of the Royal Institute of Chemistry and the Board of the Institute of Physics the Joint Council took the initiative in laying down the principles which it considered should form the basis of *Codes of Conduct* in respect of consulting and similar work accepted by members of whole-time academic staffs. After consulting the universities, technical colleges, and industry, a draft was submitted to the two Institutes. The document as finally approved was issued at the end of 1945; copies may be obtained from the Honorary Secretary of the Council. Among other matters which have recently been before the Council mention may be made of the following: Conditions of service in the reorganised Scientific Civil Service, science and the British Broadcasting Corporation, and the position of professional scientists engaged on the development of the use of atomic energy.

The Council meets at irregular intervals according to the business to be transacted.

The Hon. Secretary is Dr. H. R. Lang, F.Inst.P.

National Institute of Industrial Psychology

Aldwych House, London, W.C.2.

Telephone : Holborn 2277.

President : The Right Hon. Lord Piercy, C.B.E., B.Sc.

THE National Institute of Industrial Psychology is a scientific non-profit-making association founded in 1921, and is governed by a Council elected by its members. Its aim may be briefly stated as the improvement of mental and physical health and contentment in occupational life, by removing obstacles which stand in the path of workers of all grades. The practical work of the Institute falls under two headings: its vocational guidance service by means of which it advises young people on the careers for which their talents and temperament best fit them; and its industrial investigations, in the course of which it advises employers on means of improving conditions for workers. Under this latter heading it deals with the selection and training of workers, physical environment, improvements in methods of work, and problems of management and workers' relationships.

It carries out research in occupational psychology and seeks to spread knowledge of its principles by means of the publication of a quarterly *Journal*, the maintenance of a reference library and an information service, and the provision of lecturers.

Oil and Colour Chemists Association

7, Whiteheads Grove, Chelsea, London, S.W.3. Telephone : Kensington 8608.
President : H. W. Keenan

THE Oil and Colour Chemists' Association was formed in June 1918 "to promote by discussion and scientific investigation the technology of the industry; to inspire in members the highest ideals of a scientific vocation; and to afford them opportunities for the interchange of ideas."

The Association has a membership of approximately 1,300 and covers the following industries: Paint and pigments, varnish oils, varnishes, lacquers, soap, essential oils, linoleum and treated fabrics, printing inks, natural and synthetic resins, related products and plant, and the apparatus and raw materials used in these industries. It is financed by its own funds.

A Technical Education Committee set up by the Association has published two reports dealing with the problem of apprenticeship and vocational training in the paint, colour, and printing ink industries. A monthly *Journal of the Oil and Colour Chemists Association* is also published. Papers are regularly given.

The Association has Sections in Bristol, Hull, London, Manchester, Newcastle-upon-Tyne, Scotland, Australia and members overseas. Affiliation with kindred associations in America, India and Belgium is under consideration or in being. The Hon. Secretary is A. J. Gibson.

Pharmaceutical Society of Great Britain

17, Bloomsbury Square, London, W.C.1.
President : G. R. Knox Mazur

Telephone : Holborn 8967.

THE Pharmaceutical Society was founded in 1841 and incorporated by Royal Charter in 1843. It is the representative professional organisation of pharmacists in Great Britain, all persons registered as pharmacists being members of the Society. It is also responsible under the Privy Council for the education, examination, registration, and discipline of pharmacists and for securing the observance of the law relating to pharmacy. In the College of the Pharmaceutical Society which is a School of the University of London, research is conducted in pharmaceutical chemistry, pharmaceuticals, pharmacognosy, chemotherapy, pharmacology and nutrition. An annual report on the research work of the College is published. A number of research 'scholarships are tenable in the College and there are facilities for other research workers. The British Pharmaceutical Conference is held annually under the Society's auspices for the reading and discussion of papers on

original work. These are subsequently printed in the *Quarterly Journal of Pharmacy and Pharmacology*, a periodical published by the Society which is open to receive contributions of research papers on pharmaceutical subjects from other sources. Research is also undertaken in connection with the *British Pharmaceutical Codex*, a standard work of reference published by the Society.

Physical Society

1, Lowther Gardens, Prince Consort Road, London, S.W.7.

Telephone :

President : Professor D. Brunt, M.A., D.Sc., F.R.S.

Kensington 0048.

THE Physical Society of London was founded in 1874 to promote the advancement and diffusion of a knowledge of physics. In 1932, it amalgamated with the Optical Society to form the present Physical Society.

Membership of the Society is open to all who are interested in physics.

FELLOWSHIP. A candidate for election to Fellowship must as a rule be recommended by three Fellows, to two of whom he is known personally. Fellows may attend all meetings of the Society, are entitled to receive specified publications free of charge, and may obtain the other publications at much reduced rates.

STUDENT MEMBERSHIP. A candidate for election to Student Membership must be between 18 and 26 years of age and must be recommended from personal knowledge by a Fellow. Student Members may attend all meetings of the Society; are entitled to receive specified publications; and may obtain the other publications at much reduced rates.

GROUPS. Fellows and Student Members may become members of the Colour Group, the Optical Group, Low-Temperature Group and Acoustical Group (specialist groups formed in the Society) without payment of additional annual subscriptions; membership of the Groups is open to others interested in the special subjects upon payment of an annual subscription.

MEETINGS. Meetings are held at suitable intervals throughout each normal session for the reading and discussion of papers, for lectures, and for experimental demonstrations. Special lectures include: The *Guthrie Lecture*, in memory of the founder of the Society, given annually by a physicist of international reputation; the *Thomas Young Oration*, given biennially on an optical subject; the *Charles Chree Address*, given biennially on a geophysical subject; and the biennial *Rutherford Memorial Lecture*. A Summer Meeting is generally held each year at a provincial centre, and from time to time meetings are arranged jointly with other Societies for the discussion of subjects of common interest.

The Society awards, usually annually, the *Duddell Medal* to persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments. The *Charles Chree Medal and Prize* are awarded normally in alternate years for distinguished research in terrestrial magnetism, atmospheric electricity or cognate subjects. Two new prizes have been instituted for distinguished work in experimental physics: the *Charles Vernon Boys Prize*, awarded annually without restriction as to nationality or to membership of any society; and the *Holweck Prize* (a

memorial to a distinguished French physicist, Fernand Holweck, late Director of Research at the Radium Institute, who was tortured to death by the Gestapo), awarded annually to a French and a British physicist alternately, the presentation being made in London and in Paris, respectively.

The post-war period is one of great activity for the Society, especially in the matter of the publication of important work which has hitherto been secret. The Society's annual *Exhibition of Scientific Instruments and Apparatus* is a function of acknowledged pre-eminence in this country and the *Catalogue* is a valuable record and book of reference. The 31st exhibition of the series took place at Imperial College in April 1947.

Inquiries should be sent to the Hon. Secretary, W. Jevons, D.Sc., Ph.D.

Royal Aeronautical Society

4, Hamilton Place, London, W.1.

Telephone : Grosvenor 3515.

President : Sir Frederick Handley Page, F.R.Ae.S.

THE Royal Aeronautical Society is the oldest aeronautical institution in the world with an unbroken record. It was founded in January 1866. With it is incorporated the Institution of Aeronautical Engineers.

At the present time the Society numbers among its members practically every chief designer, constructor, and the leading members of the technical staffs, of British aeronautical firms.

The Society exists for the general advancement of aeronautical science and engineering. The activities of the Society may be divided into the following headings :

The protection of the interests of the aeronautical profession by conferring a technical status on those qualified for such distinction.

The Society acts as the professional society or institution of qualified aeronautical engineers.

The organisation of discussions and the publication of papers on subjects of importance in connection with the various branches of aeronautical science.

The encouragement and assistance of technical students desiring to adopt the aeronautical profession as a career.

The provision of a library of aeronautical literature, covering all fields of the science, engineering and history of aviation, for the use of research workers and members of the profession.

The Society has a number of branches in Great Britain and the British Empire. Technical membership of the Society is divided into Students, Fellows, Graduates, Associates and Associate Fellows. Ladies are eligible for membership of the Society.

Examinations for Associate Fellowship are usually held twice a year in the United Kingdom and abroad.

The Society maintains a library and an Information Bureau, and issues the *Journal of the Royal Aeronautical Society* and other publications.

Full information regarding the grades of membership, with the necessary application forms for election ; also the regulations for, and a syllabus of, the examinations may be obtained from the Secretary, Capt. J. L. Pritchard, Hon.F.R.Ae.S.

Royal Institute of Chemistry of Great Britain and Ireland

30, Russell Square, London, W.C.1.

Telephone : Museum 1761.

President : G. Roche Lynch, O.B.E., M.B., B.S., D.P.H., F.R.I.C.

THE Royal Institute of Chemistry, which is under the patronage of H.M. The King, is the recognised representative organisation of the profession of chemistry.

The Institute was founded in 1877 and incorporated by Royal Charter in 1885. Throughout its existence the Institute has consistently endeavoured to raise the status and efficiency of the profession of chemistry by promoting the better education of persons desiring to follow that profession ; by setting up high standards of scientific and practical proficiency ; by the examination of candidates and the registration of such as are found to be competent ; and by establishing a code of professional conduct. The bestowal of the title "Royal" on the Institute, under a Supplemental Charter granted in 1944, may be regarded as a recognition of the rapidly increasing importance of chemistry in practically every phase of the life of the community, and of the extent to which the original aims of the Institute have been attained.

The governing body of the Institute is the Council, which at present consists of the President, 6 Vice-Presidents, the Honorary Treasurer, and 42 ordinary members.

The qualifications of the Institute—the Fellowship (F.R.I.C.) and the Associateship (A.R.I.C.)—are officially recognised by Government and other authorities both at home and in other parts of the British Commonwealth.

The 1946 roll of the Institute comprises over 10,000 Fellows (F.R.I.C.) and Associates (A.R.I.C.) and includes men and women holding every type of post in which a knowledge of chemistry is necessary or desirable—in almost every branch of industry, in research institutions, in Government and municipal services, and in teaching (in universities, technical colleges, or schools), as well as in private practice. There are also about 1,500 registered Students of the Institute.

Over 20 Local Sections of the Institute have been formed in important centres. Lectures are given and discussions held on matters of scientific and professional interest under the auspices of the Sections and of the Institute itself. The Institute issues the *Journal*, *Proceedings* and other publications.

Through its representatives on the Parliamentary and Scientific Committee the Institute assists in keeping Parliament informed on the applications of science to national health and industry.

Through its Appointments and Economic Status Committee the Institute concerns itself with the remuneration and conditions of employment of its members. An Appointments Register is maintained for the benefit of employers as well as of members seeking posts. A Benevolent Fund is administered for the benefit of necessitous members and their dependents.

The Institute collaborates with the Chemical Society and the Society of Chemical Industry through the Chemical Council which has established a joint subscription scheme and a Joint Library Committee for the benefit of

members of these three Chartered Chemical bodies and other Societies associated with them.

In collaboration with the Institute of Physics, the Institute established the Joint Council of Professional Scientists, which considers and advises on matters of interest to professional scientists generally.

In co-operation with the Ministry of Education (England and Wales), the Scottish Education Department and the Ministry of Education for Northern Ireland, the Institute is concerned with the assessment of examinations for the award of National Certificates in Chemistry to part-time students.

The wide experience of the Institute on all matters affecting chemists and the profession of chemistry is always at the disposal of Government departments and close co-operation has been established in many fields where the services of chemists are of value in the public interest.

Royal Institution of Great Britain

21, Albemarle Street, London, W.1.

Telephone : Regent 0669.

President : The Right Hon. Lord Rayleigh, Sc.D., F.R.S.

THE Royal Institution for the Promotion of Science and the Diffusion and Extension of Useful Knowledge was founded in 1799. Its objects are : To prosecute scientific and literary research ; to illustrate and diffuse the principles of inductive and experimental science ; to give opportunities for social intercourse among scientists ; and to afford the means of collective and individual study.

Research is undertaken in its own laboratories, where many discoveries of importance to modern industry have been made.

Courses of lectures are held on all topics of scientific and literary interest, and are open to members and in some cases to the general public.

The Royal Institution maintains a library and publishes the *Proceedings of the Royal Institution*.

Royal Society of Arts

6-8, John Adam Street, London, W.C.2.

Telephone : Temple Bar 8274.

President : The Right Hon. The Viscount Bennett, P.C., K.C., LL.D.

THE Royal Society for the Encouragement of Arts, Manufactures and Commerce was founded in 1754, and incorporated by Royal Charter in 1847. At the time of its foundation there were only two learned societies in England—the Royal Society (which dealt with pure science) and the Society of Antiquaries. The Society of Arts had thus a very wide field to itself, and was comprehensive in its scope. During the first 50 years of its life the Society distributed nearly £30,000 in awards and prizes. These led to many improvements in agriculture, to the planting of over 50 million trees, to the introduction of many new kinds of food, and to all kinds of developments in manufacturing processes. The Society anticipated the great engineering institutions by encouraging civil, mechanical and electrical

engineering, and was the first body to promote chemical research and the application of chemistry to industry. Throughout its career it has acted as a parent society, many of the now famous institutions concerned with specialised subjects originating at meetings held at the Society's House.

One of the leading aspects of the Society's work is the holding of meetings for the reading and discussion of papers. These are published regularly in the *Journal*, which forms a continuous chronicle of the progress of the application of science and art to practical purposes.

EXHIBITIONS. The Society originated the industrial exhibitions which nowadays play so important a part in commercial and industrial life. From 1761 onwards a series of small exhibitions were held, which led to the *Great Exhibition* of 1851 (see *Royal Commission for the Exhibition of 1851*). The *Exhibition of British Art in Industry*, organised by the Society and the Royal Academy in 1935, aimed at improving British industrial design.

ALBERT MEDAL. The Society's appreciation of the services rendered to it by the Prince Consort (its one-time President) was commemorated by the foundation in 1863 of the gold *Albert Medal* which is awarded annually for high distinction in promoting arts, manufactures and commerce.

FACULTY OF ROYAL DESIGNERS FOR INDUSTRY. In 1936, the Council of the Society, realising that no high distinction had ever been created for Industrial Art as in the case of Fine Art, decided to institute a new distinction to enhance the status of industrial designers, *viz.*, "Royal Designer for Industry," indicated by the letters R.D.I., conferred upon British designers "who," in the words of the Ordinance, "have attained to high eminence and efficiency in creative design in their various spheres of industry." The distinction is also granted in honorary form to foreign designers. The number of designers to hold the distinction at any one time is limited to 40. At present there are 29.

Royal Society of Edinburgh

22, George Street, Edinburgh, 2.

Telephone : Edinburgh 22881.

President : Sir W. Wright Smith, M.A., LL.D., F.R.S.

THE Society was founded for the furtherance of science and literature, and was incorporated by Royal Charters in 1783 and 1811.

Membership consists of Ordinary and Honorary Fellows. Each candidate for admission as an Ordinary Fellow must be proposed by at least four Ordinary Fellows, two of whom must personally vouch for him as likely to prove a useful member. Membership is approximately 790 Ordinary Fellows, with about 66 Honorary Fellows (British and foreign). Admissions to Ordinary Fellowship are now limited to 25 a year.

Meetings, termed Ordinary Meetings, for reading and discussing communications and for general business, are held when convenient on the first Monday of the month from November to July inclusive (January, second Monday). There may also be special meetings. The Annual Statutory Meeting is held on the fourth Monday of October, when the session begins.

Eight Prizes are awarded by the Society for various achievements in the

interests of science. They are the *Keith, Makdougall-Brisbane, Bruce, Neill, and Bruce-Preller Lecture Fund*, awarded biennially; the *Gunning Victoria Jubilee Prize*, awarded quadrennially, and the *James Scott and David Anderson-Berry Prizes*, awarded triennially.

Papers, if suitable, are published in the Society's *Transactions*, or *Proceedings*. The Society also maintains a library.

Royal Society of London

Burlington House, London, W.1.

President : Sir Robert Robinson

Telephone : Regent 3335.

THE Royal Society of London was incorporated by Royal Charter in 1662 for the purpose of "improving natural knowledge"; a second Charter was granted in 1663 and a third in 1669. The motto chosen by the Society, on the occasion of the grant of arms by the second Charter, was *Nullius in verba* which signified its intention to verify all statements by an appeal to facts.

The Fellowship of the Society at present numbers 480, together with 50 foreign members. Twenty-five new Fellows are elected annually, each of whom must be proposed by six or more existing Fellows.

It is an established rule of the Royal Society never to give its opinion as a body upon any subject that comes before it. Whilst avoiding all political attachments, however, the Society, from time to time, acts in an advisory capacity to the Government on various scientific matters, and a considerable number of its Fellows serve on advisory committees set up by various departments of State to deal with questions of scientific importance.

The Society is responsible for the administration of some 60 funds and grants-in-aid, derived from various sources and applied to scientific research and kindred purposes. These funds fall into three categories, namely, Parliamentary grants-in-aid, research funds, and special funds.

The Parliamentary grants-in-aid are voted annually in three principal allocations, from which grants are made for (a) scientific investigations; (b) scientific publications; and (c) international research associations and scientific congresses.

The research funds are used to assist investigators by providing grants for the prosecution of their researches, for the purchase of instruments and apparatus, and for other expenses incidental to their work. Certain of these funds are applied to the endowment of research professorships, fellowships and studentships.

The special funds are devoted to the particular purposes laid down by the donor or testator in each case. Among the objects for which these funds are used are the award of medals, the delivering of lectures, the maintenance of the library and the preservation of the Society's archives.

The Society maintains a library and issues publications, including the *Philosophical Transactions* and *Proceedings*.

At the invitation of H.M. Government the Society organised the Royal Society Empire Scientific Conference which took place in June and July of 1946. The subjects discussed covered a wide field of science ranging from agriculture; through human life and work under tropical conditions;

etiology and control of infectious and transmissible diseases ; science of nutrition ; improvement of scientific information services ; interchange of scientists throughout the Empire ; Empire co-operation in science ; uniformity of physical standards ; collection and interchange of scientific records ; problems of land utilisation and conservation throughout the Empire ; a survey of the mineral resources of the Empire ; the natural products of the Empire ; to modern methods of mapping and exploration by air. Many other subjects were also discussed. The Conference was attended by over 100 scientists from the countries of the Empire.

Communications should be sent to the Society.

Society for Freedom in Science

University Museum, Oxford.

President : Sir George Thomson, F.R.S.

THE Society for Freedom in Science was founded in 1940 to promote the interests of pure science and to uphold the freedom of research-workers (especially at Universities) to choose the subjects of their investigations. The Society, which is international in scope, has 506 members. Membership is open to all established scientists who adhere to the following propositions :

(1) The increase of knowledge by scientific research of all kinds and the maintenance and spread of scientific culture have an independent and primary human value.

(2) Science can only flourish and therefore can only confer the maximum cultural and practical benefits on society when research is conducted in an atmosphere of freedom.

(3) Scientific life should be autonomous and not subject to outside control in the appointment of personnel or in the allocation of the funds assigned by society to science.

(4) The conditions of appointment of research workers at universities should give them freedom to choose their own problems within their subjects and to work separately or in collaboration as they may prefer. Controlled team-work, essential for some problems, is out of place in others. Some people work best singly, others in teams, and provision should be made for both types.

(5) Scientists in countries not under dictatorial rule should co-operate to maintain the freedom necessary for effective work and to help fellow-scientists in all parts of the world to maintain or secure this freedom.

The purposes of the Society are set out in a pamphlet entitled *The Objects of the Society for Freedom in Science* which is obtainable (post-free) from the Hon. Secretary. There is no regular subscription, but most members contribute about £1 on joining.

All communications should be addressed to the Hon. Secretary, Dr. John R. Baker, University Museum, Oxford.

Society of Chemical Industry

56, Victoria Street, London, S.W.1.

Telephone : Victoria 5215.

President : Dr. L. H. Lampitt, F.R.I.C., M.I.Chem.E.

THE Society, founded in 1881 and incorporated by Royal Charter in 1907, has as its general purpose the promotion of "the progress of applied chemistry in all its branches." Among its activities to this end are: The publication, in its *Transactions*, of the results of original work in the field of applied chemistry; the publication of *Annual Reports on the Progress of Applied Chemistry* and, through the Bureau of Chemical and Physiological Abstracts, of abstracts of papers and patents dealing with any branch of applied chemistry published in any part of the world; the issue of a weekly publication, *Chemistry and Industry*, dealing with matters of current interest, in the form of articles, reports of meetings, etc.; the organisation of meetings, including joint meetings with kindred societies, for the discussion of new developments; the organisation of Subject Groups to promote progress in certain special fields of applied chemistry.

The Society has five Subject Groups, *viz.*, Agriculture, Chemical Engineering, Food, Plastics, and Road and Building Materials. In effect these are autonomous bodies appointing their own honorary officers and committees. Their function is to promote progress in the special fields which are indicated by their titles and in normal times they publish in book form the papers which have been read at their meetings together with certain other relevant papers. These are generally called *Group Proceedings*. Only members of the Society can become members of the Groups.

Membership of the Chemical Engineering Group entails an extra subscription which is collected by the Conjoint Chemical Office, and the *Proceedings*, which are published annually, are supplied free to members of the Group. There is no subscription to the four other groups, but a charge is made for their *Group Proceedings*.

Membership is open to men and women of all nationalities and election is by the Council.

All members receive certain publications of the Society and the Bureau as part of the benefits of membership. Additional publications are obtainable at favourable rates.

Society of Dyers and Colourists

32-34, Piccadilly, Bradford.

Telephone : Bradford 4519.

President : C. M. Whittaker, B.Sc., F.T.I.

THE Society of Dyers and Colourists, which was founded in Bradford in 1884, has amongst its objects the advancement of the science and art of colour and colouring processes, matters related thereto, the dissemination of knowledge concerning them and the promotion of education and research in tinctorial science and technology. Subjects within the purview of the Society include dyestuffs and pigments, natural and synthetic fibres, detergents, bleaching, printing, colour chemistry, colour physics and colorimetry,

lighting, water treatment, dyeing and finishing machinery and the colouring or dyeing of textiles, leather, plastics, paper, paint, metals, foodstuffs, etc. In general, the Society is interested in the colouring of all substances and processes ancillary thereto.

Beginning with only 150 members, the membership of the Society now exceeds 2,400. There are seven major Sections *viz.*, the London, Huddersfield, Manchester, Midlands, Northern Ireland, Scottish and West Riding Sections, as well as Junior Branches for students in Bradford, Leeds, and Manchester. The Society has many overseas members and subscribers and the Society of Dyers and Colourists of Australia is affiliated to the parent body.

The Society issues a *Journal* and other publications. During each session the Sections hold meetings at which lectures covering a wide field are delivered. In addition to the publication of such lectures, members of the Society and others are encouraged to submit suitable communications, including the results of original research, for first publication in the *Journal*.

A number of medals are awarded by or through the Society. The *Perkin Medal* (instituted in memory of Sir William Perkin, President of the Society in 1907) is awarded periodically for discoveries or work of outstanding importance in connection with the tinctorial arts. The *Worshipful Company of Dyers Research Medal* is awarded annually for the best paper published in the *Journal* during the preceding 12 months. The *Medal of the Society of Dyers and Colourists* is awarded in recognition of exceptional services (a) to the Society or (b) in the interests of the tinctorial and allied industries. The Worshipful Company of Feltmakers also offer each year a *Gold Medal* and Diploma for work of sufficient merit relating to the art of feltmaking, published in the *Journal* during the preceding 12 months; they have also offered annually for an initial period of five years a research grant of £50. In addition the invitation to deliver the Annual Mercer Lecture before the Society, inaugurated in commemoration of the centenary of the discovery of mercerisation, is greatly esteemed.

The Society of Dyers and Colourists is governed by its Council headed by its President. The Council is assisted by a number of committees, including the Publications Committee, the Education Committee, the Fastness Tests Committee and the Dyeing Properties of Direct Cotton Dyes Committee. Each Section of the Society has its own Chairman, Hon. Secretary and Committee. The principal officers of the Society are the President, the Hon. Treasurer and the Hon. Secretary.

Editorial matters should be addressed to the Editor, C. L. Bird, M.Sc., F.R.I.C., Department of Colour Chemistry and Dyeing, The University, Leeds, 2. Other communications and inquiries should be directed to the General Secretary, P. A. Wells, M.A.(Admin.), M.Sc., A.Inst.P., A.M.I.I.A., A.I.A.C., A.C.C.S., at the offices of the Society.

Society of Inventors

Chamber of Commerce, 1, Old Hall Street, Liverpool, 3.

Chairman and Acting President: Christopher Drabble, M.I.B.F.,

A.M.I.Mech.E., A.M.I.A.E.

THE Society was founded in 1936 under the title "The Merseyside Society of Inventors" by a group of Liverpool inventors who joined together to pool their knowledge of the difficulties besetting an inventor.

Commercial contacts were established, and the Society held exhibitions of inventions, and lectures, designed to promote the interests of its members.

The Society became dormant from 1940-1945; revived in March 1945, under the title "The Society of Inventors" it set out to become a national organisation and in 1946, branches were established in Manchester where monthly meetings are held in the Engineers' Club, Albert Square, and also at Birmingham where meetings are held in the Chamber of Commerce, New Street. The Society will be inaugurated as a national body at a joint convention to be held in Buxton in May 1947.

Inquiries should be addressed to the Hon. Secretary, Richard G. Norris, M.I.B.F., 45, Wallace Drive, Huyton, Nr. Liverpool.

Television Society

Hedgeside, Holtspur End, Beaconsfield, Bucks.

President: Sir Robert Renwick, K.B.E.

THE Television Society was formed in 1927 for the furtherance of study and research in television and allied problems. It has some 500 members.

The Society holds monthly meetings (usually at the Institution of Electrical Engineers) at which papers are read and discussions held regarding all branches of the art and science of television. A *Journal* is published.

The Society is not a professional body, in that it has no examination for membership and membership does not confer professional status. There are four grades of membership: Fellows, who must have been Members of the Society for at least two years; Members who must be over 25 and possess satisfactory technical radio or electrical qualifications (Members must be proposed by one Fellow and one Member, or by two sponsors well known in the profession or to the Council); Associate Members, who must be over 21 and need not possess technical qualifications, but who may, however, be required to satisfy the Council of their interest in television (they may be proposed by two Members or Associate Members or by two sponsors on the same terms as for Members); Student Members, who must be under 21 and are eligible at the discretion of the Council (they may be proposed by two Members or Associate Members, or by two sponsors on the staff of the training institution where they are enrolled).

Separate discussion groups for non-technical viewers and experimenters are being formed and arrangements made for a Midlands Centre.

All inquiries should be addressed to the Joint Hon. Secretaries, G. Parr, M.I.E.E., 68, Compton Road, London, N.21, or O. S. Puckle, M.I.E.E., Hedgeside, Holtspur End, Beaconsfield.

Textile Institute

16, St. Mary's Parsonage, Manchester, 3.

Telephone: Blackfriars 1457.

President: Sir E. Raymond Streat, C.B.E.

THE Textile Institute was founded in 1910 to secure closer contact between practical and scientific men engaged in the textile industry, and to create a technological body worthy of such an important industry.

The Institute was incorporated by Royal Charter in 1925, and its membership has grown until there are now more than 3,000 members throughout the British Isles and in almost every country in the world.

As the sole professional body representing all branches of the textile industry, the Institute is empowered to award diplomas of professional standing; these are the Associateship and Fellowship of the Textile Institute (A.T.I. and F.T.I.).

There are, in addition to Fellows and Associates, Ordinary Members, Junior Members and Student Members. Anyone interested in the textile industry and in promoting the objects of the Institute may apply for membership.

The activities of the Institute range over all fibres, natural or synthetic, and cover all textile operations. The Institute is the only organisation connected with the textile industry at large which is not charged with serving exclusively the interests of one section of the industry, and it serves as the industry's common forum. The Institute's annual Conference is an important event in the calendar of the textile world. A technical library is maintained by the Institute and a monthly *Journal* published.

Other important activities include work on the unification of tests and testing methods; the clarification of textile terms and definitions; the consideration of problems connected with industrial recruitment and training; and the preparation and publication of text-books.

The Institute's membership is organised in geographical Sections and Branches. There are active Sections covering Lancashire (with Branches at Bolton and Blackburn); Yorkshire; the Midlands; London; Macclesfield, Leek and District; Kidderminster and District; Scotland; Belfast and Dublin. These Sections and Branches each hold their own meetings and lectures in textile centres throughout the British Isles.

The General Secretary is Harry Ibbetson, F.C.I.S.

PRODUCERS' AND MANUFACTURERS' ORGANISATIONS

Federation of British Industries (F.B.I.)

21, Tothill Street, London, S.W.1.

Telephone : Whitehall 6711.

President : Sir Frederick Bain, M.C.

THE Federation of British Industries was formed in 1916. It speaks for industry on large issues of economic policy (though not on questions affecting rates of pay or conditions of labour) and renders advice and service to member firms on their own problems, *e.g.*, research, taxation, transport, fuel economy, shipping and overseas trade.

Membership is restricted to manufacturers or producers. There are at present about 4,500 member firms and 250 trade associations representing all the leading British industries.

The direction of policy is in the hands of a Grand Council and Executive Committee. The work of the Federation also calls for a number of standing committees (for instance, Taxation, Export, and Transport) and for the creation, under the authority of the Grand Council, of other committees for inquiry on any subject which the circumstances and events of the day

may suggest. There is in existence a Committee on Industrial Research (set up at first as a special committee and appointed as a standing committee in May 1944), particulars of which are given at the end of this statement.

The Federation is represented in some eighty countries. Visits are exchanged with overseas industrial organisations and valuable conversations held on questions of common interest.

At a special meeting in December 1946, a resolution was adopted agreeing in principle to the merging into one body of the Federation of British Industries and the British Employers' Confederation, which hitherto has dealt with labour questions. The working out of a scheme will take time.

INDUSTRIAL RESEARCH COMMITTEE

Chairman : Sir William J. Larke, K.B.E., D.Sc.

Secretary : Dr. Basil J. A. Bard, B.Sc., Barrister-at-Law.

During 1946 the work of the Industrial Research Secretariat of the Federation's Industrial Research Committee has been pursued with the object of stimulating and fostering research in industry, and of safeguarding the interests of industry in relation to scientific research.

CONFERENCE ON "INDUSTRY AND RESEARCH." To this end a two-day National Conference on "Industry and Research" was held in London in March 1946, speakers at which included ministers and ex-ministers of the Crown who were or had been responsible for Departments of State concerned with research; 1,400 delegates including many of our leading scientists and representatives of industrial firms, trade associations, scientific laboratories, research associations and the Department of Scientific and Industrial Research as well as Empire and overseas representatives were present. Some 18 addresses were delivered at this Conference, and a book prepared under the auspices of the Secretariat and comprising a complete record of the Conference proceedings has recently been published.*

ROYAL SOCIETY EMPIRE SCIENTIFIC CONFERENCE. The Federation gave assistance with the organisation of, and was represented, at the major functions and meetings of the Royal Society Empire Scientific Conference, which took place last summer. At the request of the Royal Society a memorandum on the *Dissemination of Scientific and Technical Information to industry in the United Kingdom and British Commonwealth* was prepared for the official record of the Conference proceedings. This memorandum was also distributed to the trade and technical press, and evoked widespread interest.

ATOMIC ENERGY BILL. A special Sub-Committee under the Chairmanship of Sir Wallace Akers, was set up to consider the Bill and to submit amendments to the Ministry of Supply. A good proportion of the amendments recommended by the Sub-Committee was accepted after consultation with representatives of the Atomic Energy Department, and embodied in the Bill (now an Act).

RESEARCH SURVEY AND SCIENTIFIC MANPOWER. A comprehensive survey of British industry's research activities and the facilities available for it has been completed and a report will shortly be published, based on replies received from some 400 industrial firms to a detailed 26 question questionnaire. Some of the salient facts emerging were revealed at the

* *Industry and Research*, Sir Isaac Pitman and Son, Ltd.

Research Conference, and full statistical information was supplied to the Barlow Committee on Scientific Manpower, which in its report recommended the extension and ultimate doubling of British universities' capacity, and made acknowledgment of the assistance it had received from the Research Committee.

RESEARCH IN TECHNICAL COLLEGES. An investigation into Research in Technical Colleges under the Chairmanship of Sir Robert Pickard has been completed in collaboration with the Ministry of Education by a special Sub-Committee and a report has very recently been published (Industrial Research in Technical Colleges : F.B.I.).*

OTHER ACTIVITIES during the year included support for the appeal for funds for independent research at the Royal Institution ; an investigation into the allocation of priorities for the building of industrial research laboratories ; and assistance to various publications by provision of articles and information relating to industrial research.

The Secretariat has maintained close touch with the D.S.I.R. and the many other Government departments now interested in research, as well as with the principal research associations, industrial research laboratories and various scientific, technical and learned bodies.

A steadily increasing number of inquiries from member firms and others have been answered with advice, assistance, and information covering a wide range of research problems, including the use of research facilities, establishment of research departments and co-operative research organisations, application of research results for industrial purposes, and the provision of qualified staff.

Asphalt Roads Association

53, Victoria Street, London, S.W.1.
Chairman : G. J. Spicer

Telephone : Abbey 3531.

THE Asphalt Roads Association is a trade association, founded in July 1924, of firms which manufacture and lay asphalt to British Standard Specifications. The Association is, however, not a trade combine and has nothing to do with the control of prices. Its objects are to make known the results of practical experience and the established principles which control the use of asphalt in road construction. The Association is available as a consultative body to furnish to municipal and county authorities technical data relative to the construction of asphalt road surfaces, and it acts as a liaison between the Ministries of the Government and the Industry.

Extensive research since the closing years of the last century by the member firms in the manufacture and laying of asphalt has resulted in wide knowledge being obtained of the complex character of the different raw materials.

British Standard Specifications for asphalt have been issued as from 1928 onward as the result of collaboration between the Ministry of Transport, the Department of Scientific and Industrial Research, the British Standards Institution and the Association.

The Association functions as an organising centre for the collection of

* See Section on Technical Colleges.

technical information and has set up a Technical Bureau by which all technical developments and changes are fully considered. The member firms maintain laboratories where research is actively pursued.

The Association is in constant touch with the Ministry of Transport and the Department of Scientific and Industrial Research and collaborates with these Departments in their research and experiments in connection with asphalt surfaces. The Secretary is E. B. Hart, O.B.E.

Association of British Chemical Manufacturers

166, Piccadilly, London, W.1.

Telephone : Regent 4126.

Chairman : L. P. O'Brien

Director and Secretary : J. Davidson Pratt, C.B.E., M.A., B.Sc.,

M.I.Chem.E., F.R.I.C.

THE Association of British Chemical Manufacturers was formed in 1916. It exists to promote co-operation between chemical manufacturers and the Government or Government departments and to deal with all questions likely to promote industrial efficiency in the widest sense. Among its objects are the development of technical organisation; the promotion of industrial research and industrial efficiency; the advancement of applied chemistry; and, by keeping in touch with the progress made in chemical knowledge and practice, the facilitation of the development of new British industries and the extension of existing ones. There is power to supervise and finance researches undertaken in the interest of the chemical industry and to raise special funds for this purpose by voluntary contributions. There is also power to found scholarships or lectureships and in other ways to support universities and other institutions.

The Association is strictly non-political and assists whatever Government is in power. The Association is not a trading organisation, nor does it take part in price or quota conventions, or deal with wages or labour matters. It deals with all other matters for the chemical industry, such as legislation, imports and exports, tariff and key industry duties, trade statistics, patents, trade marks, safety precautions, standardisation and transport questions. Membership fees are graded according to capital.

The Association publishes a directory of *British Chemicals and their Manufacturers*. Eighteen other associations are affiliated to the A.B.C.M., of which eight are operated by the same staff.

British Brush Manufacturers Research Association

80, Coleman Street, London, E.C.2.

Telephone : Monarch 4871.

Chairman of the Council : H. C. Palmer

Director of Research : Dr. C. S. Whewell

THE brush manufacturing industry of the United Kingdom began to think about co-operative scientific research in 1943. At the time the country's scientists were fully mobilised in the war effort and the industry was looking forward to post-war days when it began to make its plans. The war with

Germany ended in May 1945, and the war with Japan in July, and in that month, with the aid of Professor J. B. Speakman and the University of Leeds, a start was made on actual research. At that time, less than 30 industries in the United Kingdom had established Research Associations, and the venture of the brush manufacturing industry was interesting in as much as, unlike most, if not all, of the other industries which had engaged in research, it was neither large nor an industry which owed its growth to the scientific discoveries of the last century. Genuine belief in the necessity of sharing in and applying scientific discoveries and methods inspired the undertaking.

There has been much research in fibres, both natural and synthetic, but only one application, namely, the development of Nylon, has much affected the industry, and generally speaking scientific methods of inquiry have not been applied to brush making problems.

British Hat and Allied Feltmakers Research Association

*Arundel House, Arundel Street, London, W.C.2. Tel. : Temple Bar 2994.
Chairman of the Council : E. E. Bourne, J.P. (The Master of the Worshipful
Company of Feltmakers)*

THIS Research Association has been formed under the ægis of the Worshipful Company of Feltmakers of London for the purpose of conducting a systematic research into what is described in the Charter (1604), under which the Company or Guild operates, as the Art or Mystery of Feltmaking.

The industry is probably one of the most ancient in the world and, doubtless for that reason, has until recent years been one of the most conservative in its methods of production and in its use of raw materials. The general shortage of raw materials during the great war, however, had a tremendous effect on the industry, and the various uses to which felt could be and was put were so numerous and varied that the foremost manufacturers were convinced of the necessity for a systemised research movement being set in motion.

Accordingly the Worshipful Company of Feltmakers was appealed to with the result that the above named Association was brought into being. As the bulk of the manufacturers were already Liverymen of the Company and many were members of the Court, the intention is to make the Company, as it were, the focus of the movement notwithstanding that the industry is dispersed over the country.

The raw materials are chiefly fur and wool, but synthetic fibres have to be taken into account, as well as dyes and other materials used in the various processes. The Management Committee of the Association will be mainly concerned with these raw materials.

For two years before the Association came into being the Feltmakers Company acted through a Committee, formed of manufacturers with seats on the Court, under the Chairmanship of the Master, for the time being, and substantial sums were paid to the University of Leeds for the purpose of following up certain lines of investigation under Professor J. B. Speakman,

the Head of the Textile Section of the University. These investigations are now being taken over by the Association itself and a very energetic and comprehensive scheme of research is being undertaken in separate buildings, with a staff of chemists and other scientists specially allocated to the tasks before them. The Association will no doubt also have to concern itself with the machinery essential for carrying out new or improved processes or for making use of discoveries, as well as with the application and improvement of dyes and other ancillary adjuncts to the trade, such as ribbons and millinery, and with the carbonisation and scouring of raw materials. For such purposes it has welcomed within its ranks representatives of such of those trades as are allied to the industry. The Secretary is W. E. Roberts.

British Hydraulic Research Association (Proposed)

94-98, Petty France, London, S.W.1.

Telephone : Abbey 1151.

Acting Secretaries : Peat, Marwick, Mitchell & Co.

HYDROMECHANICS RESEARCH. As a result of deliberations of makers of hydraulic machinery and other interested concerns, steps are being taken to establish an Association to organise research on flow within enclosed boundaries. It is anticipated that this Association will be of great benefit to users as well as to manufacturers and will materially assist the British hydraulic industry to take a foremost place in the highly competitive markets of the world by continuous development of its resources and activities.

The research envisaged may be divided into two main categories *viz* :

Fundamental research on fluid dynamics which will deal with basic scientific principles including further elucidation of the behaviour of liquids under flow conditions, and the mechanism of boundary layer flow and turbulence, leading to a fuller understanding of such phenomena as fluid friction, surface roughness and cavitation, employing where applicable the latest knowledge of modern aerodynamics.

Research on models of turbines and pumps with the object of improving the performance and predicting the characteristics both of the models and of full-scale machines. This involves investigation of the problems of the flow of water and other liquids in such machines, and also in pipes, valves, torque converters, fluid drives, servo-control arrangements, high pressure machinery and measuring instruments.

Two meetings, open to all interested parties, have been held under the Chairmanship of E. Bruce Ball of Messrs. Glenfield & Kennedy Ltd., and a Temporary Committee has been set up to investigate the scope and proceed with the formation of the Association. This Committee, as elected, consisted of seven representatives of manufacturers of hydraulic equipment, and its Chairman is G. A. Wauchope of Gwynnes Pumps Ltd. The Committee has subsequently co-opted the following additional members : H. R. Lupton of the Metropolitan Water Board, to represent the interests of waterworks authorities and other users of hydraulic equipment ; W. E. Wyatt Millington, to represent the Institution of Mechanical Engineers and the interests of consulting engineers engaged on problems relating to mechanical engineering hydraulics ; R. A. Robbins of Messrs. Ronald Trist & Co. Ltd., to represent the makers of ancillary equipment.

British Plastics Federation

47-48, Piccadilly, London, W.1.

Telephone : Regent 4681.

Chairman : W. Charles Waghorne

General Manager : W. E. de B. Diamond, M.A., Ph.D., F.R.I.C.

THE Federation was incorporated in 1933 as a Company limited by guarantee. The Federation now comprises six groups having a considerable degree of autonomy with their own Management Committees for the plastics material manufacturers, the moulders, the laminated material manufacturers, the fabricators, the engineers and the raw material suppliers. Each group elects representatives to the Council which is the governing body of the Federation. This constitution is both democratic and flexible.

The aims of the Federation, as the nationally recognised trade association of the plastics industry, are to represent the views of the members to Government departments on matters affecting the plastics industry; to promote co-operation between British subjects as manufacturers in and for the Plastics Industry; and to develop technical organisation, to promote industrial research, industrial efficiency and the advancement of the industry.

There is no separate research organisation, but most of the groups or sections of groups have technical committees which carry out considerable co-operative research and development, including preparation of specifications for materials and tolerances for using the materials in normal practice. The other technical committees elect representatives to the Main Technical Committee of the Federation which acts as a co-ordinating and liaison body for all the research and development work.

As a valuable adjunct to this work there is a Federation Information Bureau and an Abstract Service. *Abstracts* of technical and patent literature are published each month and these may be purchased by non-members.

British Road Tar Association

1, Grosvenor Place, London, S.W.1.

Telephone : Sloane 6119.

President : H. E. G. West

Technical Director : W. E. Cone

THE Association was created in 1927 by the gas, the by-product coking and the tar distilling industries to promote the expansion of the use of tar and tar products for road purposes. Its objects and functions are to stimulate improvements and to ensure the most efficient utilisation of tar for the construction and maintenance of roads, and they cover research and technical development, technical service, road demonstrations, technical literature and publicity.

Co-operative research with the Department of Scientific and Industrial Research has proved of outstanding importance. Apart from laboratory investigations, many full-scale road trials have been undertaken, and the results so far obtained have indicated practical features which may well have an important bearing on the future development of tar road construction. Co-operative research has made a noteworthy contribution to the present *British Standard Specification No. 76-1943 (Tars for Road Purposes)*. The official *Revised Recommendations for Tar Carpets and*

Recommendations for Tar Surface Dressings, also take into account the knowledge gained from research and experimental work undertaken by the D.S.I.R. jointly with the Ministry of War Transport and the Association. The forthcoming issue of the revised *British Standard Specification No. 802-1938 (Tarmacadam)* is yet another example of the advances made by research. Investigations on tar emulsions are in progress.

Linked up with the increasing attention which is being given to the application of scientific knowledge to road construction, is the need for an improved technique in the application of the materials. In order to realise this objective, close contact is maintained with highway authorities and road contractors, and by this means substantial advances have been made in the processes and methods of using road tar. The Association will co-operate to the fullest extent with the new Federation of Coated Macadam Industries in the task of improving the quality of coated macadam for roadmaking.

The policy of the Association, in collaborating with highway authorities in road demonstrations, has been more than justified by the practical results obtained and utilised. In addition to serving the purpose of introducing scientific knowledge and improvements to established forms of tar road construction, these demonstrations have covered the testing of improved forms of tar surfacings designed to carry traffic of a very heavy and concentrated nature. In all this work, invaluable data have been obtained on the factors influencing the results on the road. It is confidently expected that the knowledge which has been steadily accumulated will ultimately lead to substantial improvements in the general technique of tar road construction and maintenance.

Valuable as the contribution of road tar to road construction in this country has been in the past, there are grounds for believing that it will play a still more important part in the future. Of all home-produced materials, tar is the most plentiful as it is the most easily obtained. Its value for the construction and maintenance of roads, has long been established, and the technique of road tar production and its use have been the subject of intensive investigation. Meanwhile, technical progress in the industry is proceeding steadily with the object of securing the highest degree of quality of road tar in the service of the user. The British Road Tar Association will play its part in ensuring that fuller use is made of research and technical development work in tar road construction to meet the needs of the country's reconstruction plans.

The Secretary is D. M. MacCormack, F.C.A., A.M.Inst.T.

British Rubber Producers Research Association

48, 50 & 52, Tewin Road, Welwyn Garden City, Herts. Tel : Welwyn
Chairman of Board : H. Eric Miller Garden 933.

THE Research Association was incorporated in 1938. It is governed by a Board of six, four of whom were nominated under the hand of H.M. Secretary of State for the Colonies and two under the Common Seal of the Rubber Growers Association, Inc. The requisite funds were obtained from a cess on rubber exports from British rubber-producing territories in the East under Article 19 of the International Rubber Regulation Agreement.

Under its Director of Research, J. Wilson, M.C., M.Sc., the Association has a staff of about 30 highly qualified scientists, apart from junior and secretarial personnel, and is organised in two main departments, *i.e.* Fundamental Research and Applied Research. The purpose of the Fundamental Research Department is to lay bare the basic facts regarding the chemistry and physics of natural rubber, in the hope that technologists throughout the world will be able to make use of these facts, thereby strengthening the position of natural rubber in the world market. The purpose of the Applied Research Department is to discover new uses for rubber, and develop modified forms of natural rubber capable of entering new industrial fields.

The Fundamental Research Department is divided into three sections, Organic Research under Dr. E. H. Farmer, Physico-chemical Research under Dr. G. Gee, and Physical and Mathematical Research under Dr. L. R. G. Treloar. These men have developed, among other things, a theory of high elasticity, a thermodynamic explanation of the swelling of high polymers, have explored the organic and physical chemistry of oxidation and the function of anti-oxidants, of vulcanisation and the function of accelerators. The laboratory uses all the modern research techniques, including a computing department for the working out of problems in stress strain relationships, statistical and quantum mechanics, fourier syntheses, etc. Recently a section which includes botanists, physiologists and biochemists has been established to explore the physiology of rubber latex. The library includes all the more important scientific periodicals, text-books, etc.

The Applied Research Department under Dr. C. W. Long comprises a Technological Section, under Dr. C. M. Blow, a Development Section, under Dr. Long himself, and an Engineering Section, under B. Lambert. The purpose of the Technological Section is to evaluate the commercial possibilities of products emanating from the Fundamental Research Department and to make use of their theoretical conclusions for solving practical problems in the application of rubber, particularly when the development of a new technique and a new approach is required. The Department is fully equipped with small-scale plant and the necessary testing equipment. The purpose of the Development Section is to prepare suitable products for large-scale commercial production by designing, erecting and running pilot-plant, etc. The Engineering Section is equipped with a range of first-class machine tools and acts as handmaiden to the whole organisation, constructing and erecting plant, making special research apparatus, calculating machines, and so forth.

This Department has already developed an oil-resisting form of natural rubber and has licensed an important chemical group for the production of a new form of thermo-plastic phenol formaldehyde resin, comprising rubber chemically bonded to the resin polymer. It has also developed and licensed other products, a form of expansion jointing for concrete roadways and runways, rubber cork compositions for floatation and insulation purposes, etc.

When products are ripe for commercial development, the Board proceeds by licence to suitable corporations.

Inquiries should be sent to the Secretary, G. E. Coombs, B.Sc., at the Registered Offices, 19, Fenchurch Street, London, E.C.3.

British Tar Confederation

Gas Industry House, 1, Grosvenor Place, London, S.W.1. Tel. : Sloane 6119.
President : Sir Walter Benton Jones, Bt., LL.D.

THE Confederation was formed in 1945 for the purpose of affording a means of ascertaining and exchanging the views of those engaged in the tar industry, to enable its members to combine and co-operate in their joint interest in matters of general policy, and to promote the welfare of the tar industry generally.

The membership of the Confederation consists of the three organisations in the tar industry representing the producers and distillers of crude tar, namely : The British Association of Coke Oven Tar Producers ; the British Gas Council ; and the Association of Tar Distillers.

The Confederation is governed by an Executive Board composed of ten representatives nominated by each of the above Member Associations. Five of the representatives nominated by the British Gas Council are representative of the Association of Co-operative Tar Groups.

The Chairman and Vice-Chairmen of the Executive Board are the respective leaders of the representatives of the three Member Associations. For 1947 the Chairman is Dr. E. V. Evans, O.B.E., F.R.I.C., M.I.Gas.E., the leader of the gas interests ; and the Vice-Chairmen are R. Alsop, C.B.E., and Dr. T. Howard Butler, Ph.D., J.P., the leaders respectively of the coke oven and tar distilling interests. The Honorary Treasurer is C. E. Carey.

The Confederation has power to carry on or participate in research on behalf of the tar industry and is at present engaged upon the formation of a Coal Tar Research Association whose activities will cover research on crude tar and its products.

The Secretary is D. M. MacCormack, F.C.A., A.M.Inst.T.

Cable Makers Association

High Holborn House, 52-54, High Holborn, London, W.C.1. Telephone :
Director : Col. Sir Thomas F. Purves, O.B.E., M.I.E.E. Holborn 7633.

THE Cable Makers Association was founded in 1899 with the object of regulating the standards and maintaining the qualities of insulated cables of British manufacture. Membership at the present date comprises : Anchor Cable Co. Ltd. ; British Insulated Callender's Cables Ltd. ; Connollys (Blackley) Ltd. ; Craigpark Electric Cable Co. Ltd. ; Crompton Parkinson Ltd. (Derby Cables Ltd.) ; Edison Swan Cables Ltd. ; Enfield Cables Ltd. ; W. T. Glover & Co. Ltd. ; Greengate & Irwell Rubber Co. Ltd. ; W. T. Henleys Telegraph Works Co. Ltd. ; India Rubber, Gutta Percha & Telegraph Works Co. Ltd. ; Johnson & Phillips Ltd. ; Liverpool Electric Cable Co. Ltd. ; London Electric Wire Co. & Smiths Ltd. ; Macintosh Cable Co. Ltd. ; Metropolitan Electric Cable & Construction Co., Ltd. ; Pirelli-General Cable Works Ltd. (General Electric Co. Ltd.) ; Siemens Bros. & Co. Ltd. (Siemens Electric Lamps & Supplies Ltd.) ; St. Helens Cable & Rubber Co. Ltd. ; Standard Telephones & Cables Ltd. ; Union Cable Co. Ltd.

Soon after its formation the Cable Makers Association prepared and drew up standard lists of conductors, thicknesses of dielectric, thicknesses of lead, sizes of armouring, etc., which were adopted throughout the world as standard practice. In 1904 the Engineering Standards Committee (now the British Standards Institution) issued a report on copper conductors which was drawn up with the co-operation of the Cable Makers Association, and which to a large extent embodied the original standards promulgated by the Association; from that date onwards the Cable Makers Association has adopted the standards of the British Standards Institution, and has co-operated in the preparation of the successive revised editions which have since been issued.

In addition to standardising the dimensions, etc. of insulated cables, the Association has standardised forms of contract, and forms of tender, and it has co-operated with the Institution of Electrical Engineers and other bodies in formulating model conditions of contract. The Association has devoted great attention to systematic and large-scale research as a means of securing and maintaining the highest standard of quality in all classes of cables. As a result great advances have been made in cable-making technique. New types of cable are continually being evolved to meet special requirements or to fill old ones more efficiently.

During the year 1919 the C.M.A. acquired in all countries the copyright in a design which now appears on all labels of rubber-insulated cables made by members of the Cable Makers Association to the recognised B.S.I. standard sizes. This design was registered as a trade mark in 1939. In 1923 the Board of Trade gave permission for the letters "C.M.A." to be registered as a trade mark in connection with electric cables (first quality), and later registered a further mark "NONAZO" in connection with an alternative class of rubber cable.

The Cable Makers Association is the recognised authority in the cable trade and for nearly 50 years has maintained an influence on the cable industry which has very largely contributed to the building up of home and export British industry. The Secretary is W. G. Stiles, F.C.I.S.

Cement Makers Federation

*Terminal House, 52, Grosvenor Gardens, London, S.W.1. Tel. : Sloane 2148.
Chairman : The Right Hon. The Earl of Selborne*

THE Cement Makers Federation was formed in order to foster, develop and protect the business of cement manufacturers in the United Kingdom, having due regard to the interest of the consumer. Its constant aim has been to provide for the orderly marketing of cement, and to ensure that productive capacity keeps in step with demand. The industry has continuously sought to improve the quality of cement as well as to expand consumption. The high quality of British cement is universally recognised, and the industry's product remains well in advance of the specification called for by the British Standards Institution.

The Secretary is E. A. Harding.

Electric Lamp Manufacturers Association

25, Bedford Square, London, W.C.1.

Telephone : Museum 0766.

Director : W. J. Jones

THE object of the Electric Lamp Manufacturers Association is to formulate, regulate and secure uniformity of practice in the manufacture, sale and purchase of electric incandescent lamps in the British Isles in such a manner as to benefit both the trade and the public by the adoption of standard conditions of sale and of product.

In addition the Association supports the Electrical Research Association and its members individually have fully equipped research laboratories from which have emerged the most important developments in regard to lamps and lighting as, for example, the development of electric discharge lamps and the greatly improved street lighting.

The Association also maintains a Lighting Service Bureau which acts as a clearing house on all electric lighting matters, enabling the trade and public to obtain authoritative information on electric lighting products. The Bureau holds periodic conferences on illumination matters and maintains at 2, Savoy Hill, Strand, well-equipped demonstration rooms.

Empire Cotton Growing Corporation

1a, Harrington Road, London, S.W.7.

Telephone : Kensington 9942.

President : The Marquess of Linlithgow, K.G.

Director : L. G. Kilby, C.M.G., B.A., B.Sc.

THE Corporation was established by Royal Charter in 1921, as the outcome of the Report of a Committee appointed by the Board of Trade in 1917 to consider the development of the raw cotton resources of the Empire, excluding India, where a similar Committee was set up in the same year. The work of the Indian Central Cotton Committee runs broadly on the same lines as that of the Corporation.

In conjunction with the governments of most of the cotton-growing countries in the Empire, the Corporation staffs and maintains a number of Agricultural Experiment Stations. At those Stations, plant-breeding and selection work is carried out with a view to improving the strains of cotton and rotation crops for the areas they serve. The information gained is pooled by all the Stations and seed from improved varieties is exchanged between them.

Cotton is subject to attack by a number of insects and by a few diseases of major importance. These are studied at the Experiment Stations both by the plant-breeders and also by entomologists, physiologists and mycologists. Their team work has achieved considerable success in breeding cottons that possess a high degree of resistance to some of the pests and diseases. Linked up with the Stations are, in most cases, a number of experimental plots at spots chosen because they are representative of the varying conditions of climate, soil and pest incidence in the different parts of the surrounding country.

The acid test of a cotton is, of course, its spinning and weaving qualities.

A new strain may show considerable improvement on its predecessors in resistance to the attacks of an insect or disease, in habit of growth or yield per acre, but before a final verdict can be passed on it, it must be spun. Samples are therefore sent to the British Cotton Industry Research Association at Didsbury, Manchester, where spinning tests are carried out and the characters of the hairs are examined. Brokers' reports on the majority of the samples are also obtained.

Fundamental research into the genetics and physiology of the cotton plant has been carried on for the last 20 years at the Corporation's Central Research Station in Trinidad. This Station is in process of being transferred to East Africa in order that the staff may be able to work in close touch with a commercial cotton crop.

In addition to the papers that are submitted to scientific periodicals by members of the staff, all departments at the Experiment Stations and those at the Research Station produce annual reports which are submitted for comment to a standing Scientific Advisory Committee which meets regularly in London. This Committee comprises a number of the foremost experts in this country on the subjects involved, namely, genetics, plant-breeding, plant physiology and mycology, entomology and soil science. By submitting to this Committee not only their annual reports but also all problems in which it is likely to be able to give help or advice, the staff abroad are kept in continuous touch with the latest developments in their subjects. In addition, the Corporation makes annual grants to some of the universities and research institutions in this country, in order to be able to call on them for advice, for facilities for study-leave for members of the staff abroad, and for investigations into problems that are capable of being worked upon in this country. The Corporation's research policy is controlled by means of recommendations from the Advisory Committee, through the Executive Committee to the Administrative Council. The Corporation issues quarterly the *Empire Cotton Growing Review*. The Secretary is J. C. May.

Engineering Industries Association

9, Seymour Street, Portman Square, London, W.1. Telephone : Welbeck 2241.
President : The Rt. Hon. Viscount Davidson, P.C., G.C.V.O., C.H., C.B.

THE Engineering Industries Association is the largest association of British engineering firms and represents all phases of British engineering.

Its activities are widespread and it is especially interested in all political, economic and commercial developments affecting the engineering industry and in development of trade in British engineering products. The Association represents to the Government the views of the engineering industry on all matters of consequence, and is continually in negotiation with Government departments to secure the most enlightened treatment for the industry and for the Association's individual members.

"In the field of finance and taxation the Association has been particularly active. Surveys have been carried out to determine the effects of the existing system of taxation on the engineering industry. Based on these surveys certain representations have been made to the Chancellor of the Exchequer.

The Association, as well as its furtherance of the interests of British engineering as a whole, deals with the particular problems of its individual members, who include some of the leading and many of the small engineering firms in Britain.

A constant campaign in support of private enterprise against any undue Government control is in the forefront of the Association's policy.

The Association, in addition to specialised publications and Members' Information Papers, publishes a monthly *Bulletin* and a fortnightly *Capacity Exchange Gazette*.

The Secretary-General is Capt. C. A. Kershaw, R.N.(Retd.), E.I.I.A.

Reinforced Concrete Association

York Mansion, 94-98, Petty France, London, S.W.1. Tel. : Whitehall 9936.
President : Vacant

THE Association is registered under the Companies Act 1929 as a company limited by guarantee and not having a share capital. It is debarred from supporting with its funds any object which would give it the character of a trade union.

Its aims are : To promote, encourage and improve the science, art and practice of reinforced concrete design and construction and all operations and expedients connected therewith, and to give an impulse to ideas likely to be useful to members of the Association and the community at large ; to enable persons to meet and correspond ; to facilitate the interchange of ideas, and to acquire and disseminate information ; to promote and conduct research ; to encourage the discovery of, and investigate and make known the nature and merits of inventions ; to promote and improve the education and technical knowledge of persons engaged in any employment in connection with reinforced concrete ; to do all or any of the above-mentioned things whether affecting the whole of the membership or merely one or more particular groups or sections thereof.

There are two classes of Corporate Member : Ordinary Members, firms and companies engaged in any business relating to reinforced concrete ; and Associates, persons engaged in a technical capacity in any activity within the scope of the Association.

The Association is managed by a Council of not more than 16 Ordinary Members and not more than eight Associates.

RESEARCH. With a view to securing the more economical use of reinforced concrete by reducing the margin that exists between its theoretical and actual strength, the Association has made a number of investigations in co-operation with the Building Research Station, including : *The Redistribution of Moments in Reinforced Concrete Frames and Members* (B.R.S. Technical Paper No. 22) ; *The Strength and Deformation of Eccentrically-loaded Columns* (B.R.S. Technical Paper No. 23) ; *The Strength of Long Reinforced Concrete Columns* (B.R.S. Technical Paper No. 24) ; *The General Mechanism of Cracking and its Relation to the Amount and Distribution of Steel and Concrete Strength*.

In addition, the Association has concerned itself with the problems associated with (a) the compacting of concrete by vibration ; (b) the thermal

and acoustic insulation of reinforced concrete buildings ; (c) their behaviour (i) in fire and (ii) under aerial attack ; and has published leaflets on these matters. The Association publishes a quarterly *Review* and has also published technical papers. The Secretary is R. V. Chate.

Society of British Aircraft Constructors

32, Savile Row, London, W.1.
President : W. R. Verdon Smith

Telephone : Regent 5212.

SINCE its inception in 1916, the Society has taken a keen and active interest in technical aeronautical matters. It has served as the central co-ordinating authority for the aircraft industry on technical problems and has worked in close collaboration with other bodies, on matters concerning the design, construction and testing of aircraft and aero engines. Airworthiness requirements, both military and civil, have always been dealt with as routine matters by the Society's Technical Section, and the relevant air publications containing design requirements of the Ministry of Supply and the Air Registration Board are prepared and maintained in the closest collaboration with the Society.

The Society, in addition to supplying industrial representation on Committees of the British Standards Institution, introduced its own comprehensive range of standard aircraft parts.

In the field of research it collaborates closely with the Aeronautical Research Council on each of whose Committees an industry representative is appointed, with the Royal Aircraft Establishment in research of an applied nature, and with the Department of Scientific and Industrial Research on more general questions.

The Society's Standing Committee on Research is an active one, promoting the exchange between firms of reports on research which each has carried out. This Committee has also been responsible for the preparation of a specification for an industrial wind tunnel and has assessed the industry's post-war needs for structural test apparatus. The wind tunnel specification, which was drawn up after considerable discussion between the wind tunnel specialists of the National Establishment and of the firms concerned, is arranged to provide maximum economy of operation with ample facilities for routine test observations ; it is suitable for tests of a refined character such as those on laminar flow and low drag aerofoils.

A large degree of co-operation between firms is achieved on research matters, as is illustrated by the Society's circulation of data on pressurisation tests conducted by one firm, a subject which is of great importance for high-altitude, high-speed aircraft of the future.

Other aspects of research of a more practical nature, with which the Society is involved, include investigations into the practicability of constructing on a production basis laminar flow aerofoils, with their extremely close tolerance, and the possibilities of reducing structure weight by taking advantage of improved and new welding processes.

OTHER ORGANISATIONS INTERESTED IN RESEARCH

Association of Special Libraries and Information Bureaux (ASLIB)*52, Bloomsbury Street, London, W.C.1.**Telephone : Museum 7534.**President : Sir Reginald E. Stradling, C.B., M.C., D.Sc., F.R.S., M.I.C.E.*

THE aim of ASLIB is to facilitate the co-ordination and systematic use of sources of knowledge and information in all public affairs, in industry and commerce, and in all the arts and sciences.

Founded by a small group connected with research institutions, who met in 1924 to discuss the possibility of co-operation between their information services, the Association of Special Libraries and Information Bureaux, generally referred to as ASLIB, aroused immediate interest. By 1927 the Association had grown sufficiently to gain formal incorporation.

Corporate Membership is now open to industrial firms, research organisations, professional and educational institutions, Government departments, and to all similar bodies, at home and abroad, who are concerned in the proper dissemination and collection of information. Individual membership is also available.

Activities include the holding of an annual conference to discuss problems of particular application to members. The 21 printed reports on these conferences constitute a unique source of guidance to special librarians and information officers. In 1928 the *ASLIB Directory to Sources of Specialised Information* was first published, with financial assistance from the Carnegie United Kingdom Trust. In 1935 the quarterly *Book List* of recommended scientific and technical books was started.

The war emphasised the need for, and the usefulness of ASLIB. With normal channels disrupted on one hand, and with new departments, firms, and research organisations mushrooming on the other, such an information clearing house was essential. ASLIB, therefore, published the *War-time Guides to Sources of Specialised Information*; initiated work on the *Union Catalogue of Periodicals in British Libraries*; founded the quarterly *Journal of Documentation*; organised short courses in special librarianship; advised and assisted in the setting up of new information centres and libraries; and entered deeply into the work of the many committees, official and unofficial, touching on ASLIB's interests.

One particular wartime project, the ASLIB Microfilm Service, which was set up with the help of the Rockefeller Foundation, filled a most urgent need. Its first aim was to provide libraries with microfilm copies of material otherwise unobtainable or inaccessible. It assisted the Library of Congress by copying important manuscripts in British repositories for them, thus in great part overcoming the difficulties of intercommunication between scholars in Britain and the U.S.A. It built up a unique library of German wartime periodicals, all microfilmed, which is still available and still in demand.

Since the war there has been no lessening of activity, far from it. Annual conferences have been revived. Publication has gone forward at an increasing rate, and has included a *Manual of Special Library Technique* and a number of select booklists and bibliographies. Official recognition

was given in 1944 and the Association now receives a grant administered through the Department of Scientific and Industrial Research. Membership has doubled itself and is increasing; international ties are being strengthened; new services for information officers, special librarians and documentalists are being developed; and the sphere of usefulness of the Association to its members widened in every way possible.

Inquiries should be addressed to the Director, Miss E. M. R. Ditmas, M.A.

British Colour Council

13, Portman Square, London, W.1.

Telephone : Welbeck 4185

President : C. J. T. Cromshaw, Hon. D.Sc., B.Sc., F.R.I.C., M.I.Chem.E.,
F.T.I., F.S.S., F.R.S.E.

THE Council is a body representative of industry, supported by industry and working for industry, for the co-ordination of colour and design.

It was formed in 1930 by far-seeing men in the textile and allied trades who recognised the necessity for a colour-determining body in this country. The Council's record in the 16 years of its existence has been one of continual progress, and today its inspiration and guidance are sought by textile and allied trades throughout the world.

Formed originally to assist the women's wear industry, the Council rapidly expanded to cover the men's and children's wear trades, and the interior decoration industry, and today it is equipped to offer advice and assistance in every field of visual colour.

The Council is non-profit making, supported entirely by membership of individual firms, but does not receive any subsidy. It co-operates with many Government departments, and keeps Britain's trade representatives abroad up to date with its publications.

The Council offers general colour services under six divisions and issues regular seasonal colour ranges to members in the Women's Wear, Men's Wear and Children's Wear Divisions. Main work in the Interior Decoration Division is on the preparation of a *Dictionary of Colours for Interior Decoration* which will be published during this year, while booklets on various aspects of colour in interiors are issued from time to time. The Colour Printing and Transport Divisions at present give advisory service to firms as need arises.

The Council in its new premises plans to carry on its tradition of holding exhibitions showing the best British goods in the latest colours, with the objects of maintaining the interest of buyers in British products and of stimulating a public demand for merchandise in British colours at home and abroad through the medium of the press.

A great deal of research work lies ahead in the field of colour in factories, for machinery, in schools, etc. Here the question of lighting is vital and the correct combination of colour and lighting in industrial and school buildings is of proved benefit to eyesight, promotes health, and reduces absenteeism and the risk of accidents.

The Council is constantly conducting research to promote economy in production through the scientific use of small colour ranges. Thus by correct and skilful correlation a few colours can be used for many purposes

—for factories and offices, schools and hospitals, public buildings (cinemas, hotels, etc.), aeroplanes and airports, as well as in domestic interiors—without creating an effect of standardisation.

British Council (Science Department)

3, Hanover Street, London, W.1.

Telephone : Mayfair 8484.

Acting Director : Dr. Howard-Jones

THE British Council's Science Department, which was formed in 1941, has three main aims : The presentation and interpretation of the British contribution to science ; the provision of information to scientists overseas on all matters relating to science and its organisation in the United Kingdom ; and the development of closer cultural relations between scientists of all countries.

The Department is advised by a committee of eminent scientists under the Chairmanship of Sir Henry Dale, O.M., F.R.S.

The work of the Department, which is organised into sub-departments of medicine, engineering, agriculture and general science, proceeds along three main lines : The preparation and distribution overseas of books, pamphlets and articles describing British scientific achievements ; the building up of an information and exchange service enabling British scientists to exchange specimens and papers with scientists overseas ; and the facilitating of personal contacts between British scientists and scientists of other nations.

The Department receives requests from all parts of the world for papers, bibliographies and information on all branches of science, both theoretical and practical. In return a large number of original papers, reprints and journals are sent to this country.

Eminent British scientists are invited from time to time to conduct lecture tours abroad and arrangements are made for distinguished scientists from overseas to visit this country. In addition post-graduate courses are arranged in British universities, colleges and hospitals for students from overseas and the Department gives advice on the appointment of British professors and educational advisers to overseas universities and technical colleges. To meet the needs of scientific visitors from overseas, the Council, in consultation with officers of the Royal Society, has recently founded the Society for Visiting Scientists with premises at 5, Old Burlington Street, London, W.1.

British Export Trade Research Organisation (BETRO)

Premier House, 48, Dover Street, London, W.1.

Telephone : Regent 3001.

Chairman : Leslie Gamage, M.C.

THE British Export Trade Research Organisation was created in the spring of 1945, by approximately 100 leading banks, manufacturers and advertising agents, who believed that, in the national interest, a co-operative non-profit making research organisation should be formed to support and

assist British manufacturers and traders in their approach to overseas markets.

Today some 700 firms are availing themselves of this service, the Big Five Banks are members, and the Bank of England is an annual subscriber.

BETRO, through its organisation at home and overseas, is now an established and permanent channel through which the British manufacturer can secure accurate information about the economic and trade conditions, commercial practices, habits, customs, and official restrictions in the markets in which he is particularly interested.

In 1946, BETRO successfully handled nearly 500 research commissions and trade inquiries for its members. The products involved covered almost every industry in Great Britain—textiles, machinery, foodstuffs, medicines and motor cars.

British Society for International Bibliography

(Incorporating the Central Agricultural and Scientific Bibliography)

28, Victoria Street, London, S.W.1.

President : S. C. Bradford, D.Sc., F.L.A.

THE British Society for International Bibliography was founded in December 1927 as the British National Section of the International Federation for Documentation, to bring together those in Britain who are engaged or interested in documentation, and to maintain close contact with those workers who have similar interests in other countries.

The Society has the following aims: To promote the study of bibliographical methods; to organise the exchange of views and experiences concerning bibliography and the development of information services; and to promote national and international conformity of method and comprehensiveness in bibliographical work.

Since its foundation, the Society has been able to induce some thirty undertakings in this country to adopt the Universal Decimal Classification to classify their published abstracts. So that, with a somewhat larger number of such unified concerns in other countries and some large internal files, 150,000 references to scientific and technical literature were classified by the Society's standard methods every year.

Membership of the Society comprises Honorary Members, Ordinary Members and Corporate Members. Inquiries should be addressed to the President, Mulberry Cottage, 8, Marryat Road, Wimbledon, S.W.19.

British Standards Institution (B.S.I.)

28, Victoria Street, London, S.W.1.

Telephone : Abbey 3333.

President : The Right Hon. Lord Woolton, P.C., C.H.

THE work of the British Standards Institution began in 1901 with the formation of an Engineering Standards Committee. The Institution was incorporated by Royal Charter in 1929, and is recognised as "the sole organisation for the issue, in consultation with any government, professional

or industrial bodies concerned, of standards having a national application." It is thus the national organisation for the promulgation of British Standard terms, definitions, codes of practice and specifications for materials, articles and methods of tests.

Standards are prepared on the principles that (a) they shall be in accordance with the needs of industry and fulfil a generally recognised want; (b) the interest of both producer and consumer shall be considered; and (c) periodic review shall be undertaken.

The Institution is governed by a General Council. Work is divided into Engineering, Chemical, Building, and Textile Divisions, administered by Divisional Councils. Industry, as well as the Board of Trade, the Department of Scientific and Industrial Research, the National Physical Laboratory, the Federation of British Industries, and the Association of British Chambers of Commerce, are represented on the General Council.

The Institution co-operates with the National Standards bodies in various parts of the Commonwealth, and with the American Standards Association. It also participates in the United Nations Standards Co-ordinating Committee, which has the object of promoting the maximum possible co-ordination and unification of standards necessary for the post-war period.

The preparation of each standard is the responsibility of the industry primarily concerned. This is effected by the establishment of separate Industry (Standards) Committees, each being representative of both producer and user interests. In this way the maximum degree of co-operation is achieved. In addition to the industry committees, special committees which do not come within the scope of the Divisional Councils report directly to the General Council. These are: Documentation; Office and Works Equipment (Metal); Printing, Stationery and Allied Trades; Upholstery and Bedding Fillings; Catalogue Sizes; Women's Garments; Office Methods for Use by the Building and Civil Engineering Contracting Industries; Office Aid to the Factory; Packaging; Quality Control; Mark; and Personal Safety Equipment Committees.

Over 1,400 specifications have been issued since the formation of the Institution, which also works on the establishment of agreed terms and definitions, methods of test, standards of performance and Codes of Practice. A monthly list is issued to members, giving information on new work started during the month; draft standards ready for circulation; new published standards; and foreign standards received from abroad.

Special wartime work was undertaken for the then Ministry of Home Security, in connection with civil defence apparatus and the use of light in civil defence. The importance of packaging in wartime production, and its increasing problems, led the Institution in 1942 to issue a schedule of sizes and types of packages of pre-packed commodities for the home trade. In 1943, as the result of a request from the Anglo-American Packaging Committee of the Ministry of Production, the B.S.I. published its *British Standard Packaging Code*, and a *Supplement* dealing with packing for tropical climates has now also been issued. Other important wartime work was done by the committee set up to consider the most efficient procedure to promote simplification and greater efficiency on the clerical side of works production and organisation; this committee has prepared booklets dealing with principles of production-control, pay-roll methods, office organisation and practice, drawing-office organisation, and production-

control in the small factory, while others are in preparation. For the Ministry of Supply, important work has included the co-ordination of steel specifications in the United Kingdom, Canada and the United States of America, and work on the co-ordination of screw threads and threaded products.

It has been agreed that the work of the Institution will continue to be carried on by the Industry Committees, each of which is established only with the concurrence of the industrial and professional organisations concerned. Representatives of Government departments are included wherever appropriate. These Committees are the basis of the whole organisation and are the points at which standardisation is initiated and carried out. The co-ordination of their work is secured by the Divisional Councils.

The Institution maintains a library and an inquiry bureau and issues publications.

British subjects, and any organisation formed or incorporated under the laws of any part of the British Commonwealth, are qualified for election as contributing members.

Cotton Board, Colour, Design and Style Centre

17a, York Street, Manchester, 2.

Telephone : Central 1121.

Chairman of the Cotton Board : Sir E. Raymond Streat, C.B.E.

Director of Colour, Design and Style Centre : J. Cleveland Belle

THE Colour, Design and Style Centre, which is the first of its kind, was started in 1940 with a view to raising the prestige of the products of the British cotton industry throughout the world, especially in the colour, design and style of dress and furnishing fabrics.

The Centre is a sponsor of good taste. It tries to do its work by inspiring and promoting better design. Its policy is to influence and stimulate taste, by showing examples of good design to the industry as a whole, and indirectly to the community it serves.

It encourages inquiries from all sections of the industry. It is an essential part of its work to put the manufacturers into touch with the best artists and designers and to prove to the fashion houses that cotton has an appeal of its own and can take its place as a versatile and successful fabric in the field of fashion.

The Centre has its own Exhibition Hall in which exhibitions are held regularly, besides displays and lectures which stress the importance of the colouring and designing of fabrics as well as the styling of clothes. These exhibitions, of which twenty-seven have been held to date, include textile designs on paper by designers and world famous artists, and collections of priceless works of art which help to inspire the designer. There are also exhibitions and mannequin parades of well-styled cotton garments which show the beauty and excellence of this fabric.

Another part of the Centre's work is to study the tastes and fashions of other countries and here again, the Exhibition Hall is used to show collections of fabrics and fashions from the Continent and North and South America. This helps to show the industry here how they may best cater for the tastes and requirements of our overseas customers.

Design Research Unit (D.R.U.)

37, Park Street, London, W.1.

Chairman : Herbert Read

Telephone : Mayfair 9255.

DESIGN Research Unit was established in January 1943 to provide a practical design service for industry ; to collect and correlate information about industrial design from all sources for manufacturers who need advice ; to carry out research into the needs of the consumer and into the ability of the machine to meet those needs, and from this research to evolve designs which are suitable for machine production, and at the same time efficient and beautiful ; to improve existing design by bringing together designers and technical experts to experiment in new materials and new uses of old materials ; above all, to create a school of design which is contemporary in spirit and progressive in outlook.

Design Research Unit is an association of industrial designers, architects and engineers. It was established to meet an increasing need. As a result of the growing importance of qualitative standards in the export markets, design is beginning to be recognised as an essential element in all successful industrial enterprise.

The function of D.R.U. is to focus on every project it undertakes the combined knowledge of several creative minds, since it believes that only by pooling the talents of a team of designers is it possible to offer a service capable of meeting every demand from the wide field of present day industry. D.R.U. consists of a central design directorate working in permanent consultation, and this group is in touch with a number of independent designers specialising in different fields. It has a call on their services on behalf of its clients, and in appropriate cases a technologist is invited to work under the direction of one or more members of the Board. Similarly, the Unit maintains close touch with research technicians on many aspects of materials, production and marketing.

Successful design is based on data, not on inspiration alone. No problems can be solved until the terms of reference are defined. Every design problem raises certain questions which require answers. Some will be available, others must be discovered by research. This research is part of the design process. The final design is not simply created, but evolved through a series of developing stages.

D.R.U. is a professional organisation. It occupies, in relation to design, a position parallel to that of groups of practitioners concerned with other aspects of industry such as accountancy, management and scientific research. It will undertake either specific assignments on the basis of an agreed fee, or a continuous advisory service for a retaining fee.

Inquiries should be sent to the Business Manager.

Fulmer Research Institute

Stoke Poges, Buckinghamshire

Chairman : W. C. Devereux, F.R.Ae.S.

Director of Research : E. A. G. Liddiard, M.A., F.I.M.

Telephone : Fulmer 7.

THE Fulmer Research Institute has been founded to extend the facilities for private research for industrial firms, by tackling problems which are not

within the scope of the average industrial laboratory. It is the only important research organisation in Great Britain where independently sponsored work can be carried out confidentially and where the results of research and any patents arising from them remain the property of the sponsor. The Institute does not distribute profits and any excess of income over expenditure is devoted to extending the services it can offer. It does not compete with any other research centre in this country, its nearest parallel being the American organisations such as the Battelle Institute.

The present scope of research covers metallurgy and allied subjects, including alloy research (light alloys and materials for high temperature service), vacuum melting, refining and distillation, mechanical⁷ and physical testing, x-ray crystallography, corrosion testing, electrodeposition, and metal finishing and refractories. A library and information service is maintained and the Institute is open to consultation on technical problems. Laboratory facilities are available for sponsors' nominees. The present staff totals 40, and the laboratory space approximately 20,000 square feet.

Manchester Joint Research Council

Chamber of Commerce, Ship Canal House, King Street, Manchester, 2.

Telephone : Deansgate 5574.

The University, Oxford Road, Manchester, 13. Telephone : Ardwick 2681.

Chairman : A. H. S. Hinchliffe, D.L., J.P.

THE Council was founded by the Vice-Chancellor of the Manchester University and the President of the Manchester Chamber of Commerce on a common desire to set up machinery which would bring business men and scientists into more effective collaboration.

There are 16 members of Council nominated by the University, 16 nominated by the Chamber of Commerce, together with one member from the Department of Scientific and Industrial Research and one from the British Cotton Industry Research Association.

The Council does not itself carry out research—though it does conduct inquiries into the degree to which local industry utilises the scientific approach to its problems—and has for its main objects : (a) The encouragement of activities designed to bring science and industry into closer relationship ; (b) the dissemination of new knowledge and the acceleration of its use and application ; (c) the encouragement of research ; (d) the initiation of discussions, the pursuance of special inquiries and investigations on industrial, scientific and cognate matters including the consideration of economic and sociological problems.

Conferences are arranged on matters of importance, *vide* the recent conference on "Research and the Smaller Firm" at which papers by leading industrialists and scientists were delivered and debated to demonstrate the best lines of approach by the smaller firms seeking to obtain the benefits of scientific research.

An Information Service is maintained.

Inquiries regarding information and suggestions bearing on the work of the Council should be addressed to the Executive Liaison Officer, A. D. Butchart.

Parliamentary and Scientific Committee

6, *Queen Anne's Gate, London, S.W.1.*

Telephone : *Whitehall 6421.*

President : *The Right Hon. Sir John Anderson, F.R.S., M.P.*

THE Parliamentary and Scientific Committee is a non-party body formed with the object of providing a permanent liaison between scientific bodies and Parliament. It seeks to become a centre for the consideration and discussion of scientific information bearing on current proceedings in Parliament. It was constituted in November 1939, to take over the functions of the Parliamentary Science Committee which suspended its activities on the outbreak of hostilities.

It is felt that substantial benefits would result if the numerous societies concerned with scientific and technological activities were to combine their influence, with the object of ensuring that Parliament shall have proper regard for the importance of scientific methods in relation to public affairs.

The Committee endeavours to enlist the interest and support of as many scientific and technological societies as possible so that the influence of science can be effectively felt in the councils of the State.

The Committee also strives amongst other things : To provide Members of Parliament with authoritative scientific information from time to time in connection with debates ; to bring to the notice of Members of Parliament and Government departments the results of scientific research and technical development which bear upon questions of current public interest ; to arrange for suitable action through Parliamentary channels whenever necessary to ensure that proper regard is had for the scientific point of view ; to examine all legislation likely to affect the foregoing and to take such action as may be suitable ; to watch the financing of scientific research ; and to provide its members and other approved subscribers with a regular summary of scientific and technological matters dealt with in Parliament.

The officers of the Committee comprise the following, to be elected or re-elected at the Annual General Meeting with a three years' maximum eligibility : A President (to be a Member of one of the Houses of Parliament) ; Vice-Presidents (to a maximum of seven) ; a Chairman (to be a member of one of the Houses of Parliament) ; a Vice-Chairman ; a Deputy-Chairman (to be a member of one of the Houses of Parliament) ; two Honorary Secretaries and an Honorary Treasurer ; a salaried Secretary responsible for administrative matters, the compilation of *Science in Parliament*, etc.

Membership is open, subject to election by the General Committee (on terms to be ascertained from the Secretaries, see below) to any recognised scientific organisation or society.

MEETINGS. The General Committee meets about ten times a year.

Inquiries should be sent to the Secretaries of the Committee, Messrs. Watney & Powell at the above address.

Refrigerated Cargo Research Council

Cunard House, 88, Leadenhall Street, London, E.C.3. Tel. : Avenue 5655.

Laboratory Premises : Falcon Yard, Cambridge

Chairman : A. I. Anderson

Technical Director : Dr. A. J. Smith, O.B.E.

THE Council was formed in 1945 by British liner companies operating refrigerated ships in the Australian, New Zealand, South American, South African and North Pacific Trades. It will conduct research into the transport of perishable cargoes and the design and construction of refrigerated spaces, a field which was opened up in the early work carried out under the auspices of the Food Investigation Board, the Department of Scientific and Industrial Research. Its object is to secure the most efficient and economical methods of carrying existing refrigerated cargoes and of exploring the possibilities of transporting other perishable products at present considered impracticable.

The Council has an Executive Committee representative of both the managerial and technical sides of the shipping industry on which the D.S.I.R. is represented by the Director of Food Investigation. The research work is in charge of the Technical Director who controls a small permanent staff supplemented by temporary secondment of sea-going refrigerating engineers from the member lines. Close liaison also is maintained with other scientific organisations at home and in the Dominions, with whose work that of the Council is intimately linked.

The Secretary is A. E. Alcock.

Scottish Seaweed Research Association

28, Rutland Street, Edinburgh.

Telephone : Edinburgh 24847.

Chairman : Sir A. Steven Bilsland, Bt., M.C.

THE Association was established in July 1944 through the inspiration of the Ministry of Supply and the Scottish Council on Industry, supported by the Scottish Agricultural Organisation Society.

The aims of the Association are : To determine the types and quantities of seaweed and marine vegetable growths available and suitable for commercial purposes in Scotland and to investigate factors affecting the growth of seaweed round the coasts of Scotland ; to investigate possible methods of increasing production and growth and to study the composition of various different types of seaweed ; to determine the nature of the plant and equipment required for harvesting and handling Scottish seaweed economically and to conduct market surveys of the various products derived from the manufacture of Scottish seaweed ; to correlate and record the results of these investigations and the findings of the staff engaged therein and to make known such results and findings to members of the Association ; to endeavour to interest commercial undertakings in the use of Scottish seaweed in the process of their manufactures and of the products thereof arising from manufacture or otherwise ; to apply for, take out, and register, in such names as the board of management may arrange, patents both

provisional and final in connection with any process developed or discovered in the course of the work of the Association, or any machinery or plant designed for the purpose of harvesting, handling or manufacture of seaweed or the products thereof and to assign such patents to such Government organisation as the Development Commissioners may direct, on the footing that members of the Association shall be entitled to apply upon the most favourable terms for licences to operate or manufacture under such patents.

INTERNATIONAL

International Council of Scientific Unions

Gonville and Caius College, Cambridge

President : Dr. J. A. Fleming, Carnegie Institution, Washington

THE Council was formed in 1931 at a meeting at Brussels when it succeeded to the International Research Council. This latter body, founded in 1919 after the end of the first world war, had as its object the grouping of various international scientific assemblies and congresses into organised Unions acting under the general control of the Council. The purposes of the present Council are : To co-ordinate the national adhering organisations and the various adhering International Unions ; to direct international activity in subjects which do not fall within the purview of any existing international association ; and to enter into relations with the Governments of countries adhering to the Council in order to promote scientific investigation in those countries.

A country may adhere through its principal academy, its national research council, some other national institution or association of institutions, or, in the absence of these, through its government.

New Unions may be formed by the Council or admitted by the General Assembly of the Council, which in general meets once every three years.

The chief scientific activity of the Council has been in connection with joint committees in which more than one Union has been concerned, such as committees on solar and terrestrial relationships, science and social relations, the ionosphere, oceanography.

The International Unions that adhere to the Council are those of Astronomy, Geodesy and Geophysics, Chemistry, Radio-Science, Physics, Geography, and Biology.

Inquiries should be sent to the Secretary-General, Professor F. J. M. Stratton.

International Organisation for Standardisation (ISO)

*Buckingham House, 19, Palace Street, London, S.W.1. Tel. : Victoria 6277.
Provisional Secretariat : United Nations Standards Co-ordinating Committee*

AT a meeting of representatives of the National Standards Bodies of 25 nations, held in London from 14th to 26th October, 1946, it was agreed that the International Standards Association should be considered as having

been dissolved as from April 1942 and a draft constitution and by-laws for a new International Organisation for Standardisation was unanimously agreed upon and accepted by the first meeting of the General Assembly of the Organisation on 24th October, for submission to the National Standards Bodies for ratification. The seat of the Secretariat is to be in Geneva.

The objects of the Organisation shall be : To facilitate the co-ordination and unification of the standards of the member bodies. As means to this end, *inter alia* : (a) It may organise the exchange of information regarding the work carried out by each member body ; (b) it may set forth principles for the guidance of the Member Bodies in their work ; (c) it may co-operate with other international organisations dealing with related questions ; (d) it may set up International standards, provided, in each case, no member body dissents.

The first President of the new organisation is to be Howard Coonley, Chairman of the Executive Committee of the American Standards Association, the Vice-President, Gustave L. Gerard, President of the Belgian Standards Institution, and the Treasurer, F. Streiff, President of the Swiss Standards Organisation.

The operations of the Organisation are to be administered by a Council consisting of the President and ten members together representing 11 different member bodies ; the member bodies being the National Standards Bodies of the various countries in whom is vested the ultimate authority. For the next five years the five major countries, namely, China, France, the United Kingdom, U.S.A. and U.S.S.R. will each have a seat on the Council. The other countries which now have seats on the Council are Australia ; Norway (for four years) ; Belgium ; India (for three years) ; and Brazil and Switzerland (for two years).

Regarding technical work, 12 subjects with order of priority have been suggested for immediate consideration and the United Kingdom is being asked to undertake the Secretariat for the work on metal food containers, iron and steel (including cast iron and cast steel), rubber, coal and coal products, laboratory glassware, and glass cylinders and identification marks.

International Wool Secretariat

Dorland House, 18-20, Regent Street, London, S.W.1. Tel. : Abbey 4651.
Chairman : Dr. E. H. Booth

THE International Wool Secretariat exists to promote the world-wide interests of wool. With Head Office in London, branches in New York and Paris, its activities extend to all countries where wool is produced, manufactured or sold.

SCIENTIFIC RESEARCH. Whilst biological and pastoral research is mainly conducted in the primary producing countries, the Secretariat sponsors scientific research into the chemical and physical qualities affecting the processing properties of the wool fibre ; the uses of by-products such as wool grease ; and textile engineering research, etc. Work conducted under the auspices of the Secretariat is being carried out at the Wool Industries Research Association at Torridon, Leeds, and at the Textile Department of Leeds University. The Secretariat's Department of Scientific and Technical

Liaison maintains contact and liaison with all research workers interested in the textile properties of wool.

ECONOMIC RESEARCH. The activities of the Secretariat's Economic Research Department comprise : The issue of a fortnightly economic news bulletin for private circulation ; a comprehensive *ad hoc* economic information service ; economic liaison with other research organisations ; long-term research in regard to wool consumption prospects, wool-marketing techniques and all wider economic problems affecting the interests of the wool industries.

PUBLICITY AND PROMOTION. The Secretariat's Department of Information organises the Secretariat's News Service which is circulated to the World's Press. News releases, a photographic service, trade editorials and Press receptions assure that wool development and news are publicised. In addition the Department is responsible for a national advertising campaign directed towards the consumer public and related to specific fields within the wool industry.

EXPOSITION AND TRADE RELATIONS. By means of sales aids, displays, exhibitions and lectures, every assistance and encouragement is given by the Department of Exposition and Trade Relations to the retail trade. Mannequin parades further fashion interests and the uses of wool in industry are being promoted. Fashion trends are made known by this department's *London News Service* and *Paris News*. A comprehensive library of fabrics is a source of reference for the trade.

EDUCATION. The Secretariat's Department of Education arranges for lectures to schools, technical colleges, clubs, and guilds, etc. The purpose of these lectures is to explain the historical and economic background of the wool industries ; the nature of the wool fibre and its quality characteristics ; techniques in wool-processing ; and other subjects of general interest in regard to wool. Schools are provided with illustrated pamphlets giving the story of wool, charts showing the stages of wool-manufacture, and coloured wall maps.

All communications should be addressed to the Secretary.

Directory of Organisations Interested in Industrial Research*

GENERAL

PROFESSIONAL AND LEARNED SOCIETIES

- Association of Scientific Workers**, 15, Half Moon Street, London, W.1. (Grosvenor 4761).
British Association for the Advancement of Science, Burlington House, London, W.1. (Regent 2109).
Chartered Institute of Patent Agents, Staple Inn Buildings, London, W.C.1. (Holborn 9450).
Imperial Institute, *see* section Official Directories.
Institute of Patentees, 25, Victoria Street, London, S.W.1. (Whitehall 1616).
Institution of Professional Civil Servants, 17, Hans Place, London, S.W.1. (Kensington 0118).
International Council of Scientific Unions, Gonville and Carus College, Cambridge.
Joint Council of Professional Scientists, c/o The Institute of Physics, 47, Belgrave Square, London, S.W.1. (Sloane 9806).
Manchester Federation of Scientific Societies, Hon. Sec., Dr E. H. Rodd, Imperial Chemical Industries, Ltd., Dyestuffs Division, Blackley, Manchester. (Cheetham Hill 1460).
Microscopical Society, B.M.A. House, Tavistock Square, London, W.C.1. (Euston 2048).
Royal Institution of Great Britain, 21, Albemarle Street, London, W.1. (Regent 0669).
Royal Scottish Society of Arts, 16, Royal Terrace, Edinburgh, 7. (Edinburgh 203041).
Royal Society of Arts, 6-8, John Adam Street, London, W.C.2. (Temple Bar 8274).
Royal Society of Edinburgh, 22, George Street, Edinburgh, 2. (Edinburgh 22881).
Royal Society of London, Burlington House, London, W.1. (Regent 3335).
Royal Statistical Society, 4, Portugal Street, London, W.C.2. (Holborn 4283).
Scientific Society of the Royal Technical College, Glasgow, Hon. Sec., T. L. Chapman, Dennistoun, Glasgow, E.1.
Society for Freedom in Science, University Museum, Oxford.
Society for the Protection of Science and Learning, c/o Westminster College, 55, Hills Road, Cambridge. (Cambridge 55926).
Society of Inventors, Chamber of Commerce Building, 1, Old Hall Street, Liverpool, 3.
Society of Visiting Scientists, 5, Old Burlington Street, London, W.1. (Regent 1069).

INDUSTRIAL ASSOCIATIONS

- British Empire Producers' Organisation**, 22, Queen Anne's Gate, London, S.W.1. (Whitehall 3387).
British Employers' Confederation, 21, Tothill Street, London, S.W.1. (Whitehall 9827).
Empire Industries Association, 9, Victoria Street, London, S.W.1. (Abbey 6572).

* For organisations interested in technical education in general, *see* end of section on Technical Colleges. For City Guilds (livery companies), *see* end of this Directory.

- Federation of British Industries (Industrial Research Secretariat)**, 21, Tothill Street, London, S.W.1. (Whitehall 6711).
National Chamber of Trade, 3, Victoria Street, London, S.W.1. (Abbey 5204).
National Union of Manufacturers, 6, Holborn Viaduct, London, E.C.1. (City 6031).
Northern Industrial Group, 9, Eldon Square, Newcastle-upon-Tyne. (Newcastle 22939).
South Wales and Monmouthshire Industries Association, Aberdare House, Mount Stuart Square, Cardiff. (Cardiff 7985).

OTHER ORGANISATIONS

- Association for Scientific Photography**: *see* Royal Photographic Society.
Association of Special Libraries and Information Bureaux (ASLIB), 52, Bloomsbury Street, London, W.C.1. (Museum 7534).
British Council (Science Department), 3, Hanover Street, London, W.1. (Mayfair 8484).
British Society for International Bibliography, 28, Victoria Street, London, S.W.1.
British Standards Institution (B.S.I.), 28, Victoria Street, London, S.W.1. (Abbey 3333).
Bureau of Abstracts, 9-10, Savile Row, London, W.1.
Edinburgh Scientific Film Society, Gen. Sec., James Horsack, 10, Wardie Avenue, Edinburgh. Film Sec., W. Newlands, 3, Craig's Crescent, Edinburgh, 12.
Institute of Trade Mark Agents, Ltd., 69, Cannon Street, London, E.C.4. (City 4444).
Manchester Joint Research Council, Chamber of Commerce, Ship Canal House, King Street, Manchester, 2. (Deansgate 5574).
Nuffield Foundation, 12-13, Mecklenburgh Square, London, W.C.1. (Terminus 5288).
Parliamentary and Scientific Committee, 6, Queen Anne's Gate, London, S.W.1. (Whitehall 6421).
Research Co-ordination Committee, 20, Buckingham Street, London, W.C.2. (Temple Bar 8701).
Scientific Film Association, 34, Soho Square, London, W.1. (Gerrard 1620).
Scottish Council (Development and Industry), 28, Alva Street, Edinburgh, 2. (Edinburgh 24425).
Scottish Statistical Research Bureau, Faculty of Actuaries, 23, St. Andrew Square, Edinburgh. (Edinburgh 27096).
United Nations Educational, Scientific and Cultural Organisation (UNESCO), *see* section Official Directories.
United Nations Standards Co-ordinating Committee, Buckingham House, 19, Palace Street, London, S.W.1. (Victoria 6277).

PHYSICS

PROFESSIONAL AND LEARNED SOCIETIES

- Atomic Scientists' Association**, c/o Professor P. B. Moon, Birmingham University, Birmingham. (Selly Oak 1181). Inquiries regarding membership should be sent to The Membership Secretaries, Dr. N. Kurti and Dr. G. O. Jones, Clarendon Laboratory, Parks Road, Oxford.
Bradford Electronics Society, Technical College, Bradford. (Bradford 12112).
Institute of Physics, 19, Albemarle Street, London, W.1. (Regent 3541).
Institution of Electronics, *see* under Electricity.
National Physical Laboratory, *see* section Official Directories under Department of Scientific and Industrial Research.
Physical Society, 1, Lowther Gardens, Prince Consort Road, London, S.W.7. (Kensington 0048).
Royal Physical Society of Edinburgh, Synod Hall, Castle Terrace, Edinburgh, 1. (Edinburgh 21720).

CHEMISTRY

PROFESSIONAL AND LEARNED SOCIETIES

- British Association of Chemists**, Empire House, 175, Piccadilly, London, W.1. (Regent 6611).
Chemical Council, Conjoint Chemical Office, 9-10, Savile Row, London, W.1. (Regent 2714).
Chemical Engineering Group (Society of Chemical Industry), 56, Victoria Street, London, S.W.1. (Victoria 6161).
Chemical Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.
Chemical Society, Burlington House, Piccadilly, London, W.1. (Regent 1675).
Chemical Society of University College, Southampton, University College, Southampton.
Faraday Society, 6, Gray's Inn Square, London, W.C.1. (Chancery 8101).
Institution of Chemical Engineers, *see* Engineering.
Royal Institute of Chemistry of Great Britain and Ireland, 30, Russell Square, London, W.C.1. (Museum 1761).
Society of Chemical Industry, 56, Victoria Street, London, S.W.1. (Victoria 5215).
Society of Public Analysts and Other Analytical Chemists, 7-8, Idol Lane, London, E.C.3. (Mansion House 6608).
University of Manchester Chemical Society, c/o The Chemistry Department, Manchester University, Manchester, 13.
University of Oxford Alembic Club, c/o Senior Treasurer, Inorganic Chemistry Laboratory, South Parks Road, Oxford.
University of St. Andrews Chemical Society, The University, St. Andrews, Fife.
University of Sheffield Chemical Society, The University, Sheffield, 10.

INDUSTRIAL ASSOCIATIONS

- Association of British Chemical Manufacturers**, 166, Piccadilly, London, W.1. (Regent 4126).
Association of Chemical and Allied Employers, 21, Spring Gardens, Manchester, 2. (Blackfriars 6801).
British Chemical Plant Manufacturers' Association, *see* Engineering.
Chemical Workers' Union, 155, Kennington Park Road, London, S.E.11. (Reliance 3938).
Society of Chemical Industry, 56, Victoria Street, London, S.W.1. (Victoria 5215).

For other organisations interested in applied chemistry, *see* under Paints, Pharmacy, Plastics, Rubber, Textiles, etc.

BUILDING AND CONSTRUCTIONAL MATERIALS *

RESEARCH AND DEVELOPMENT ASSOCIATIONS

- Aircraft Industries Research Organisation on Housing**, 11, Upper Grosvenor Street, London, W.1.
Building Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.
Coal Tar Research Association, Gas Industry House, 1, Grosvenor Place, London, S.W.1. (Sloane 5136).
Forest Products Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.
Lead Industries Development Council, Eagle House, Jermyn Street, London, S.W.1. (Whitehall 7264).
Road Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.

* *See also* Metals

Timber Development Association, 75, Cannon Street, London, E.C.4. (City 6146).

PROFESSIONAL SOCIETIES

Association of Building Technicians, 5, Ashley Place, London, S.W.1. (Victoria 0447).

Incorporated Association of Architects and Surveyors, 75, Eaton Place, London, S.W.1. (Sloane 5615).

Royal Institute of British Architects (Architectural Science Board), 66, Portland Place, London, W.1. (Welbeck 5721).

Society of Chemical Industry (Road and Building Materials Group), 56, Victoria Street, London, S.W.1. (Victoria 5215).

MANUFACTURERS' ASSOCIATIONS

Asphalt Roads Association, Ltd., 53, Victoria Street, London, S.W.1. (Abbey 3531).

Association of Tar Distillers, 166, Piccadilly, London, W.1. (Regent 4126).

British Cast Concrete Federation, 17, Amherst Road, London, W.13. (Perivale 6869).

British Road Tar Association, 1, Grosvenor Place, London, S.W.1. (Sloane 6119).

British Tar Confederation, Gas Industry House, 1, Grosvenor Place, London, S.W.1. (Sloane 6119).

Cement and Concrete Association, 52, Grosvenor Gate, London, S.W.1. (Sloane 1623).

Cement Makers' Federation, Terminal House, 52, Grosvenor Gardens, London, S.W.1. (Sloane 2148).

English Joinery Manufacturers' Association (Incorporated) (EJMA), Sackville House, 40, Piccadilly, London, W.1. (Regent 4448).

Federated Home Timber Association, 69, Cannon Street, London, E.C.4. (City 4444).

Federation of Coated Macadam Industries, 37, Chester Square, London, S.W.1. (Sloane 1002).

National Council of Building Material Producers, 2, Caxton Street, London, S.W.1. (Abbey 5111).

Natural Asphalte Mine-Owners' Council, 94, Petty France, London, S.W.1. (Abbey 1010 and 1041).

Reinforced Concrete Association, York Mansion, 94-98, Petty France, London, S.W.1. (Whitehall 9936).

OTHER ORGANISATIONS

British Road Federation, Ltd., 4a, Bloomsbury Square, London, W.C.1. (Holborn 3345).

Building Centre, 9, Conduit Street, London, W.1. (Mayfair 2128).

Building Industries National Council, 11, Weymouth Street, London, W.1. (Langham 2785).

Roads Improvement Association (Incorporated), 180, Clapham Road, London, S.W.9. (Reliance 2688).

Scottish Building Centre, 425-427, Sauchiehall Street, Glasgow. (Douglas 0372).

CERAMICS AND GLASS

RESEARCH ASSOCIATIONS

British Pottery Research Association, Beechfield, Queen's Road, Penkhull, Stoke-on-Trent. (Stoke-on-Trent 48741).

British Refractories Research Association, Mellor Laboratories, Hanley, Stoke-on-Trent. (Stoke-on-Trent 29641).

Glass Delegacy of the University of Sheffield, Department of Glass Technology, The University, "Elmfield", Northumberland Road, Sheffield, 10. (Broomhill 62467).

LEARNED SOCIETIES

British Ceramic Society, North Staffordshire Technical College, Stoke-on-Trent (Stoke-on-Trent 48655).

Society of Glass Technology, *see* Glass Delegacy above.

PRODUCERS' AND MANUFACTURERS' ASSOCIATIONS

British China Clay Producers' Federation, Limited, Barclays Bank Chambers, St. Austell, Cornwall. (St. Austell 547).

British Pottery Manufacturers' Federation, Federation House, Station Road, Stoke-on-Trent.

Glass Manufacturers' Federation, High Holborn House, 52-54, High Holborn, London, W.C.1. (Holborn 6209). Director's Office: 16, Rosary Gardens, London, S.W. (Freemantle 0902).

National Association of Clayworks Managers, Rodney House, 6, Monmouth Street, London, W.C.2. (Temple Bar 2340).

National Federation of Clay Industries, Drayton House, 30, Gordon Street, London, W.C.1. (Euston 2568).

ELECTRICITY AND ELECTRICAL ENGINEERING

RESEARCH AND DEVELOPMENT ASSOCIATIONS

British Electrical and Allied Industries Research Association, 15, Savoy Street, London, W.C.2. (Temple Bar 7907).

British Electrical Development Association, 2, Savoy Hill, London, W.C.2. (Temple Bar 9434).

Radio Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.

PROFESSIONAL AND LEARNED SOCIETIES

Association of Supervising Electrical Engineers, 54, Station Road, New Barnet, Herts. (Barnet 6731).

British Institution of Radio Engineers, 9, Bedford Square, London, W.C.1. (Museum 1901).

British Sound Recording Association, BCM/BSRA, London, W.C.1. (Primrose 3269).

Edinburgh Electrical Society, Hon. Sec., Andrew M. Niven, c/o Bruce Peebles & Co., Ltd., East Pilton, Edinburgh, 5. (Edinburgh 83261).

Electrical Power Engineers' Association, 102, St. George's Square, London, S.W.1. (Victoria 6524).

Electrodepositors' Technical Society, 27, Islington High Street, London, N.1.

Illuminating Engineering Society, 32, Victoria Street, London, S.W.1. (Abbey 5215).

Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2. (Temple Bar 7676).

Institution of Electronics, 24, Buckingham Street, Strand, London, W.C.2. (Temple Bar 6368).

Institution of Post Office Electrical Engineers, G.P.O., Alder House, London, E.C.1. (Headquarters 1234).

Radio Society of Great Britain, 28, Little Russell Street, London, W.C.1. (Holborn 7373).

Relay Services Association of Great Britain, *see* Society of Relay Engineers below.

Society of Relay Engineers and Relay Services Association of Great Britain, 25, High Street, Tunbridge Wells, Kent. (Tunbridge Wells 305).

Television Society, Hedgeside, Holtsur End, Beaconsfield, Bucks.

MANUFACTURING AND SUPPLY ASSOCIATIONS

British Electrical and Allied Manufacturers' Association (Inc.) (B.E.A.M.A.), 36, Kingsway, London, W.C.2. (Holborn 0502).

British Radio Valve Manufacturers' Association, Piccadilly House, 16, Jermyn Street, London, S.W.1. (Regent 5186).

- Electric Lamp Manufacturers' Association**, 25, Bedford Square, London, W.C.1. (Museum 0766).
- Electric Light Fittings Association**, 36, Kingsway, London, W.C.2. (Holborn 0502).
- Electrical Contractors' Association of Scotland**, 55, Frederick Street, Edinburgh 2. (Edinburgh 33984).
- Electrical Sign Manufacturers' Association**, 36, Kingsway, London, W.C.2. (Holborn 0502).
- Electricity Supply Joint Committee**, Phoenix Buildings, Dudley Road, Wolverhampton.
- Incorporated Association of Electric Power Companies**, 58, Abbey House, Victoria Street, London, S.W.1. (Abbey 2110).
- Incorporated Municipal Electrical Association**, Kingsway House, Fifth Floor, 103, Kingsway, London, W.C.2.
- National Federated Electrical Association**, Africa House, Kingsway, London, W.C.2. (Holborn 7584).
- Provincial Electric Supply Association**, County House, 46-47, New Broad Street, London, E.C.2. (London Wall 1280).
- Radio Component Manufacturers' Federation**, 22, Surrey Street, London, W.C.2. (Temple Bar 6740).
- Radio Industry Council**, 59, Russell Square, London, W.C.1. (Museum 6901).
- Telecommunication Engineering and Manufacturing Association**, 10, Bedford Street, London W.C.2. (Temple Bar 6824).

OTHER ORGANISATIONS

- Caroline Haslett Trust**, c/o Miss C. Haslett, Electrical Association for Women, 35, Grosvenor Place, London, S.W.1. (Sloane 0401).
- Central Electricity Board**, Trafalgar Buildings, 1, Charing Cross, London, S.W.1. (Whitehall 2121).
- Electrical Association for Women**, 35, Grosvenor Place, London, S.W.1. (Sloane 0401).
- Lighting Service Bureau**, 2, Savoy Hill, London, W.C.2. (Temple Bar 7337).

ENGINEERING

RESEARCH ASSOCIATIONS

- British Hydraulic Research Association (proposed)**, Acting Secretaries, Peat, Marwick, Mitchell & Co., 94-98, Petty France, London, S.W.1. (Abbey 1151).
- British Internal Combustion Engine Research Association**, 111-112, Buckingham Avenue, Slough, Bucks. (Slough 20295).
- British Shipbuilding Research Association**, 5, Chesterfield Gardens, Curzon Street, London, W.1. (Grosvenor 8891).
- British Welding Research Association**, *see* Metals.
- Motor Industry Research Association**, Great West Road, Brentford, Middlesex. (Ealing 4741).
- Parsons and Marine Engineering Turbine Research and Development Association (PAMETRADA)**, Pametrada Research Station, Wallsend-on-Tyne. (Wallsend 64061).
- Production Engineering Research Association of Great Britain (PERA)**, Staveley Lodge, Melton Mowbray, Leics. (Melton Mowbray 561).

PROFESSIONAL SOCIETIES

- Agricultural Engineers Association**, Finsbury House, Bloomfield Street, London, E.C.2. (London Wall 2466).
- Association of Consulting Engineers**, 36, Victoria Street, London, S.W.1. (Abbey 6557).
- Association of Engineering and Shipbuilding Draughtsmen**, 96, St. George's Square, London, S.W.1. (Victoria 0747-8).
- Association of Mining Electrical and Mechanical Engineers**, 28, Kennedy Street, Manchester. (Central 5502).
- Association of Polish Engineers in Great Britain**, 9, Sussex Square, London, W.2. (Paddington 0054, Extn. 11 and 13).

- Association of Public Lighting Engineers**, 68, Victoria Street, London, S.W.1. (Victoria 9132).
- Association of Supervisory Staffs and Engineering Technicians**, 150, Southampton Row, London, W.C.1. (Terminus 8043-4).
- British Engineers' Association**, 32, Victoria Street, London, S.W.1. (Abbey 2141).
- Chemical Engineering Group**, *see* Chemistry.
- Diesel Engine Users Association**, 56, Victoria Street, London, S.W.1. (Victoria 6161).
- Engineering Society (Inc.) Liverpool**, 9, The Temple, Dale Street, Liverpool. (Central 3717).
- Engineering Society of King's College**, University of London, W.C.2.
- Engineers' Study Group on Economics**, 20, Buckingham Street, London, W.C.2. (Temple Bar 8701).
- Hull Chemical and Engineering Society**, c/o Hon. General Secretary, 14, The Oval, Garden Village, Hull. (Hull 12918).
- Illuminating Engineering Society**, 32, Victoria Street, London, S.W.1. (Abbey 5215).
- Institute of Marine Engineers**, 85, The Minories, London, E.C.3. (Royal 2974).
- Institute of the Motor Industry Incorporated** (*formerly Institute of the Motor Trade*), 40, Queen's Gate, London, S.W.7. (Western 0915 and 1525).
- Institute of Refrigeration**, Empire House, St. Martin's le Grand, London, E.C.1. (Monarch 7391).
- Institute of Road Transport Engineers, Ltd.**, 174, Palace Chambers, Bridge Street, London, S.W.1. (Whitehall 8971).
- Institute of Transport**, 15, Savoy Street, London, W.C.2. (Temple Bar 6030).
- Institute of Welding**, *see* Metals.
- Institution of Automobile Engineers**, 12, Hobart Place, London, S.W.1. (Sloane 2191).
- Institution of British Agricultural Engineers**, 68, Victoria Street, London, S.W.1. (Victoria 8237).
- Institution of British Engineers**, Windsor House, Victoria Street, London, S.W.1. (Abbey 4100).
- Institution of Chemical Engineers**, 56, Victoria Street, London, S.W.1. (Victoria 6161).
- Institution of Civil Engineers**, Great George Street, London, S.W.1. (Whitehall 4577-9).
- Institution of Engineering Inspection**, 2, Caxton Street, London, S.W.1. (Abbey 6220).
- Institution of Engineers and Shipbuilders in Scotland**, 39, Elmbank Crescent, Glasgow, C.2. (Central 5181).
- Institution of Fire Engineers**, 2, Millbank House, Great Peter Street, London, S.W.1. (Abbey 7422).
- Institution of Gas Engineers**, Gas Industry House, 1, Grosvenor Place, London, S.W.1. (Sloane 8266).
- Institution of Heating and Ventilating Engineers**, 72-74, Victoria Street, London, S.W.1. (Victoria 0146-7).
- Institution of Highway Engineers**, 55, Romney Street, Westminster, London, S.W.1. (Abbey 3891-2).
- Institution of Locomotive Engineers**, 28, Victoria Street, London, S.W.1. (Abbey 6672).
- Institution of Mechanical Engineers**, Storey's Gate, St. James's Park, London, S.W.1. (Whitehall 7476).
- Institution of Mining Engineers**, 436, Salisbury House, London, E.C.2. (Clerkenwell 3980).
- Institution of Municipal and County Engineers**, 84, Eccleston Square, London, S.W.1. (Victoria 5083).
- Institution of Naval Architects**, 10, Upper Belgrave Street, London, S.W.1. (Sloane 4622).
- Institution of Production Engineers**, 10, Seymour Street, London, W.1. (Welbeck 2232-3).
- Institution of Railway Signal Engineers**, 2, Caxton Street, London, S.W.1. (Abbey 6220).

- Institution of Royal Engineers (Military Science)**, Chatham, Kent. (Chatham 2669).
- Institution of Sanitary Engineers**, 118, Victoria Street, London, S.W.1. (Victoria 3017).
- Institution of Structural Engineers**, 11, Upper Belgrave Street, London, S.W.1. (Sloane 7128).
- Institution of Water Engineers**, Parliament Mansions, Abbey Orchard Street, London, S.W.1. (Abbey 6740).
- London Association of Engineers**, 6, Broad Street Place, London, E.C.2. (London Wall 3541).
- Manchester Geological and Mining Society**, The Wigan and District Mining and Technical College, Library Street, Wigan. (Wigan 2554).
- Midland Counties Institution of Engineers**, c/o A. E. Fox, Technical College, Workop, Notts.
- Mining Institute of Scotland**, Royal Technical College, Glasgow.
- National Institute of Agricultural Engineering**, Askham Bryan, York. (York 6421).
- Newcomen Society for the Study of the History of Engineering and Technology**, 43, King's Road, London, S.W.3. (Sloane 8883).
- North-East Coast Institution of Engineers and Shipbuilders**, Bolbec Hall, Westgate Road, Newcastle-upon-Tyne. (Newcastle-upon-Tyne 20289).
- North of England Institute of Mining and Mechanical Engineers**, Neville Hall, Newcastle-upon-Tyne. (Newcastle-upon-Tyne 22201).
- Royal Aeronautical Society**, 4, Hamilton Place, London, W.1. (Grosvenor 3515).
- Society of Engineers (Inc.)**, 17, Victoria Street, London, S.W.1. (Abbey 7244).
- Society of Laundry Engineers and Allied Trades, Ltd.**, 52, Surbiton Hill Park, Surbiton, Surrey. (Elmbridge 3029).
- Society of Model and Experimental Engineers**, 20, Nassau Street, London, W.1. Secretary: J. J. Pacey, 69, Chandos Avenue, London, N.20. (Hillside 3018).
- South Staffordshire and Warwickshire Institute of Mining Engineers**, 3, Newhall Street, Birmingham, 3. (Central 7287).
- South Wales Institute of Engineers**, Park Place, Cardiff. (Cardiff 4981).
- Women's Engineering Society**, 35, Grosvenor Place, London, S.W.1. (Sloane 0401).

MANUFACTURERS' ASSOCIATIONS

- British Chemical Plant Manufacturers' Association**, 26, Portland Place, London, W.1. (Langham 3121).
- British Compressed Air Society**, 94-98, Petty France, London, S.W.1. (Abbey 1151).
- British Internal Combustion Engine Manufacturers' Association**, 32, Victoria Street, London, S.W.1. (Abbey 2181).
- British Refrigeration Association (B.R.A.)**, 1, Lincoln's Inn Fields, London, W.C.2. (Holborn 4248-9).
- Cable Makers' Association**, High Holborn House, 52-54, High Holborn, London, W.C.1. (Holborn 7633).
- Engineering Industries Association**, 9, Seymour Street, London, W.1. (Welbeck 2241).
- Food Machinery Industrial and Export Group**, 26, Portland Place, London, W.1. (Langham 3121).
- Gauge and Tool Makers' Association**, Standbrook House, 2-5, Old Bond Street, London, W.1. (Regent 3451).
- Machine Tool Trades Association (Inc.)**, Victoria House, Southampton Row, London, W.C.1. (Holborn 4667).
- National Federation of Engineers' Tools Manufacturers**, 2, Caxton Street, London, S.W.1. (Whitehall 4258).
- Society of British Aircraft Constructors**, 32, Savile Row, London, W.1. (Regent 5212).
- Society of Motor Manufacturers and Traders Ltd.**, 148, Piccadilly, London, W.1. (Grosvenor 4040).

OTHER ORGANISATIONS

- Automobile Association (A.A.)**, Fanum House, New Coventry Street, London, W.1. (Whitehall 1200).
North-East Engineering Bureau, Guildhall, Quayside, Newcastle-upon-Tyne, 1. (Newcastle-upon-Tyne 24071-2).
Railway Research Service, 4, Cowley Street, London, S.W.1. (Whitehall 3225).
Stephenson Locomotive Society, c/o H. C. Casserley, Ravensbourne, Berkhamsted, Herts.;

FOOD *

RESEARCH ASSOCIATIONS

- British Baking Industries Research Association**, Wellington House, 125-130, Strand, London, W.C.2. (Temple Bar 2686).
British Food Manufacturing Industries Research Association, 57, Catherine Place, London, S.W.1. (Victoria 4317).
Food Investigation Board, see section Official Directories under Department of Scientific and Industrial Research.
Hannah Dairy Research Institute, The, Kirkhill, Ayr. (Prestwick 7292).
Imperial Bureau of Dairy Science, Shinfield, Reading.
Refrigerated Cargo Research Council, Cunard House, 88, Leadenhall Street, London, E.C.3. (Avenue 5655).
Research Association of British Flour-Millers, Old London Road, St. Albans, Herts. (St. Albans 640).
Sugar Beet Research and Education Committee, Government Buildings, Brooksea, Lytham St. Annes, Lancs.

PROFESSIONAL AND LEARNED SOCIETIES

- † **Institute of Brewing**, (temporary address) The Goring Hotel, Grosvenor Gardens, London, S.W.1. (Victoria 8211).
Institute of Meat, 5, Charterhouse Square, London, E.C.1. (Clerkenwell 4086).
Nutrition Society, c/o Dunn Nutritional Laboratory, Milton Road, Cambridge.
Society of Chemical Industry (Food Group), 56, Victoria Street, London, S.W.1. (Victoria 5215).
Society of Dairy Technology, 19, Bloomsbury Square, London, W.C.1. (Museum 5846).

MANUFACTURERS' ASSOCIATIONS

- Brewers' Guild (Inc.)**, 8, Bream's Buildings, London, E.C.4. (Holborn 4565).
Brewers' Society, 42, Portman Square, London, W.1. (Welbeck 0382).
Incorporated National Association of British and Irish Millers, Ltd., 19, St. Matthews Avenue, Surbiton, Surrey. (Elmbridge 3759).
National Association of Master Bakers, Confectioners and Caterers, Wellington House, 125-130, Strand, London, W.C.2. (Temple Bar 2686).
National Association of Soft Drinks Manufacturers (formerly known as The National Union of Mineral Water Manufacturers' Associations Limited), 42, Upper Grosvenor Street, London, W.1. (Grosvenor 3930).
North of Scotland Oatmeal Millers' Association, 15, Union Terrace, Aberdeen. (Aberdeen 540).
Soft Drinks Industry Wartime Association, Ltd., 42, Upper Grosvenor Street, London, W.1. (Grosvenor 3931).
Wine and Spirit Association of Great Britain, Vintners' Hall, London, E.C.4. (Central 1615 and 2132).

OTHER ORGANISATIONS

- Empire Tea Bureau**, 22, Regent Street, London, S.W.1. (Whitehall 8632-9).
Tea Centre, 22, Regent Street, London, S.W.1. (Whitehall 8632).
International Sugar Council, Trafalgar House, Waterloo Place, London, S.W.1. (Abbey 3287).

* Including brewing and distilling.

† The Institute is the technical and research association of the brewing industry.

FUEL *

RESEARCH ASSOCIATIONS

British Coal Utilisation Research Association (B.C.U.R.A.), 13, Grosvenor Gardens, London, S.W.1. (Victoria 1534).

British Coke Research Association, 11-12, Pall Mall, London, S.W.1. (Abbey 6772).

British Colliery Owners' Research Association. (Functions taken over by the National Coal Board, *q.v.* in section Official Directories).

Fuel Research Board, *see* section Official Directories under Department of Scientific and Industrial Research.

Gas Research Board, Gas Industry House, 1, Grosvenor Place, London, S.W.1. (Sloane 8266).

Safety in Mines Research Board, *see* section Official Directories.

PROFESSIONAL AND LEARNED SOCIETIES

Institute of Fuel, 18, Devonshire Street, London, W.1. (Welbeck 4124).

Institute of Petroleum, 26, Portland Place, London, W.1. (Langham 2250).

Institution of Gas Engineers, *see* Engineering.

National Association of Colliery Managers, St. Nicholas Chambers, Amen Corner, Newcastle-upon-Tyne. (Newcastle-upon-Tyne 23382).

MANUFACTURERS' ASSOCIATIONS

British Acetylene Association, 22, Ashley Place, London, S.W.1. (Victoria 5106).

British Coking Industry Association, 11-12, Pall Mall, London, S.W.1. (Abbey 6772).

British Gas Council, 1, Grosvenor Place, London, S.W.1. (Sloane 4554).

British Hard Coke Association (renamed British Coking Industry Association, *q.v.*).

Coal Industry Society, c/o Messrs. John Hudson & Co., Ltd., 8, Lloyd's Avenue, London, E.C.3. (Royal 3171).

Combustion Appliance Makers' Association (Solid Fuel), Bolton House, Curzon Street, London, W.1. (Grosvenor 1634).

Council of British Manufacturers of Petroleum Equipment, 40, Palace Chambers, Bridge Street, London, S.W.1. (Abbey 4843).

London and Counties Coke Association, 1, Grosvenor Place, London, S.W.1. (Sloane 5136).

National Gas Council of Great Britain and Ireland, 1, Grosvenor Place, London, S.W.1. (Sloane 4554).

Society of British Gas Industries, 56, Victoria Street, London, S.W.1. (Victoria 8948).

Solid Smokeless Fuels Federation, 1, Grosvenor Place, London, S.W.1. (Sloane 5136 and 5208).

OTHER ORGANISATIONS

Coal Utilisation Joint Council, 54, Victoria Street, London, S.W.1. (Victoria 9851).

Midland Junior Gas Association, Hon. Sec., H. J. Reynolds, Gas Works, Stafford Road, Wolverhampton. (Wolverhampton 21353).

National Coal Board, *see* Official Directories.

National Smoke Abatement Society, Chandos House, Buckingham Gate, London, S.W.1. (Abbey 1359).

Women's Gas Council, 1, Grosvenor Place, London, S.W.1. (Sloane 4554).

World Power Conference, Central Office, 201-2, Grand Buildings, Trafalgar Square, London, W.C.2. (Whitehall 3966).

INDUSTRIAL DESIGN

Central Institute of Art and Design, 41-42, Dover Street, London, W.1. (Regent 3075).

Council of Industrial Design, Tilbury House, Petty France, London, S.W.1. (Whitehall 6322).

* *See also* Electricity.

- Design and Industries Association**, 9, Conduit Street, London, W.1. (Mayfair 0477).
Design Group Ltd., Commonwealth House, High Holborn, London, W.C.1. (Chancery 6451).
Design Research Unit (D.R.U.), 37, Park Street, London, W.1. (Mayfair 9255).
Faculty of Royal Designers for Industry, 6-8, John Adam Street, London, W.C.2. (Temple Bar 8274).
Scottish Committee of the Council of Industrial Design, 95, Bothwell Street, Glasgow, C.2. (Central 2991-2).
Society of Industrial Artists, Room 243, Empire House, St. Martin's le Grand, London, E.C.1. (Metropolitan 8344).

LEATHER

RESEARCH ASSOCIATIONS

- British Boot, Shoe and Allied Trades Research Association**, Satra House, Rockingham Road, Kettering, Northants. (Kettering 3528).
British Leather Manufacturers Research Association, 1-6, Nelson Square, London, S.E.1. (Waterloo 4432).

PROFESSIONAL SOCIETIES

- International Society of Leather Trades Chemists**, Craigieburn, Duppas Hill Road, Waddon, Croydon. (Croydon 0240).
National Institute of the Boot and Shoe Industry (Inc.), 4, Deansgate, Northampton. (Northampton 4810).

MANUFACTURERS' ASSOCIATIONS

- Federation of Curriers, Light Leather Tanners and Dressers (Inc.)**, 9, St. Thomas Street, London, S.E.1. (Hop 3881).
Federation of Leather Belting Manufacturers of the United Kingdom, 1, Booth Street, Manchester. (Deansgate 3017).
Incorporated National Federation of Boot Trades Associations, Ltd., 150, Southampton Row, London, W.C.1. (Terminus 4917).
Leather, Footwear and Allied Industries Export Corporation Ltd., 1, Cathedral Street, London, S.E.1. (Hopkinson 0703-6).
National Leather Goods and Saddlery Manufacturers' Association, 69, Cannon Street, London, E.C.4. (City 4444).

MANAGEMENT AND MARKETING

RESEARCH ASSOCIATIONS

- British Export Trade Research Organisation (BETRO)**, Premier House, 48, Dover Street, London, W.1. (Regent 3001).
British Market Research Bureau, Ltd., 6, Grafton Street, London, W.1. (Regent 8121).

INSTITUTES

- British Institute of Management**, Room 453, I.C.I. House, Millbank, London, S.W.1.
Institute of Cost and Works Accountants, 23, Queen Square, London, W.C.1. (Terminus 4164).
Institute of Distribution (activities now suspended).
Institute of Industrial Administration, Artillery House, Artillery Row, London, S.W.1. (Abbey 1820 and 5137).
National Institute of Industrial Psychology, Aldwych House, London, W.C.2. (Holborn 2277).

METALS

RESEARCH AND DEVELOPMENT ASSOCIATIONS

- Aluminium Development Association**, 33, Grosvenor Street, London, W.1. (Mayfair 7501).

- British Cast Iron Research Association**, Alvechurch, Birmingham. (Redditch 716).
- British Iron and Steel Research Association**, 11, Park Lane, London, W.1. (Grosvenor 4751).
- British Non-Ferrous Metals Research Association**, 81-91, Euston Street, London, N.W.1. (Euston 3372).
- British Welding Research Association**, 29, Park Crescent, London, W.1. (Welbeck 7485).
- Coil Spring Federation (Springs Research Organisation)**, Secretaries : Pear, Marwick and Mitchell, 301, Glossop Road, Sheffield.
- Copper Development Association**, Kendals Hall, Radlett, Herts. (Radlett 5616), and Grand Buildings, Trafalgar Square, London, W.C.2. (Abbey 2677).
- Design and Research Centre for the Gold, Silver, Jewellery and Allied Trades**, Goldsmiths' Company, Goldsmiths' Hall, Foster Lane, London, E.C.2. (Monarch 1668-9).
- Fulmer Research Institute, Ltd.**, Stoke Poges, Buckinghamshire. (Fulmer 7).
- International Meehanite Research Institute**, 66, Victoria Street, London, S.W.1.
- Tin Research Institute**, Fraser Road, Greenford, Middlesex. (Perivale 4254).
- Zinc Development Association**, Lincoln House, Turl Street, Oxford. (Oxford 47988).

PROFESSIONAL AND LEARNED SOCIETIES

- Birmingham Metallurgical Society**, 253, Longbridge Lane, Northfield, Birmingham 3. (Central 5257).
- Institute of British Foundrymen**, St. John Street Chambers, Deansgate, Manchester, 3. (Blackfriars 6178).
- Institute of Metals**, 4, Grosvenor Gardens, London, S.W.1. (Sloane 6233).
- Institute of Welding**, 2, Buckingham Palace Gardens, London, S.W.1. (Sloane 9851).
- Institution of Metallurgists**, 4, Grosvenor Gardens, London, S.W.1. (Sloane 0061).
- Institution of Mining and Metallurgy**, Salisbury House, Finsbury Circus, London, E.C.2. (Clerkenwell 4984).
- Iron and Steel Institute**, 4, Grosvenor Gardens, London, S.W.1. (Sloane 0061).
- Sheffield Metallurgical Association**, 198, West Street, Sheffield. (Sheffield 24959).
- Stainless Steel Fabrications Association**, Chamber of Commerce, 95, New Street, Birmingham, 2. (Midland 5021).
- West of Scotland Iron and Steel Institute**, 39, Elmbank Crescent, Glasgow, C.2. (Central 5181).

MANUFACTURERS' ASSOCIATIONS

- Association of Steel Conduit Manufacturers**, 25, Bennett's Hill, Birmingham, 2. (Midland 4258).
- Birmingham Jewellers' and Silversmiths' Association**, *see* British Joint Association of Goldsmiths etc.
- Black Bolt and Nut Association of Great Britain**, 25, Bennett's Hill, Birmingham. (Midland 2901).
- Brass and Copper Tube Association**, King Edward House, New Street, Birmingham, 2. (Midland 6083).
- Brass Wire Association**, Lombard House, Great Charles Street, Birmingham.
- British Iron and Steel Federation**, Steel House, 11, Tothill Street, London, S.W.1. (Whitehall 1030).
- British Ironfounders' Association**, 145 St. Vincent Street, Glasgow.
- British Joint Association of Goldsmiths, Silversmiths, Horological and Kindred Trades** (formerly the Birmingham Jewellers' and Silversmiths' Association). Head Office : 27, Frederick Street, Birmingham, 1. (Central 2567-9). London Office : 93-94, Hatton Garden, London, E.C.1. (Holborn 4820).
- British Metal Window Manufacturers' Association**, 2, Great Peter Street, London, S.W.1. (Whitehall 9606).
- British Non-Ferrous Metals Association**, 132 Hagley Road, Birmingham, 16. (Edgbaston 3886-7-8).

- British Steel Founders' Association**, The Secretaries, Peat, Marwick, Mitchell & Co., 301, Glossop Road, Sheffield, 10. (Broomhill 63031).
- Cold Rolled Brass and Copper Association**, 115, Colmore Row, Birmingham. (Central 2642).
- High Conductivity Copper Association**, 52-54, High Holborn, London, W.C.1. (Chancery 8561).
- Joint Iron Council**, Derbyshire House, Belgrove Street, London, W.C.1. (Terminus 7218).
- Metal Finishing Association**, 93-94, Hatton Garden, London, E.C.1. (Holborn 4820).
- National Association of Drop Forgers and Stampers**, Grove Hill House, 245, Grove Lane, Handsworth, Birmingham, 20. (Northern 3311-3).
- National Light Castings Ironfounders' Federation**, 145, St. Vincent Street, Glasgow, C.2. (Central 2891-2).
- Sheet and Strip Users' Technical Association**, 49, Wellington Street, London, W.C.2.
- Steelworks Plant Association**, The Secretaries, Peat, Marwick, Mitchell & Co., York Mansions, Petty France, London, S.W.1. (Abbey 1829).
- Tin Producers' Association**, 11, Ironmonger Lane, London, E.C.2. (Royal 3288).
- Water Tube Boiler Makers' Association**, 14, Old Square, Lincoln's Inn, London, W.C.2.
- Welsh Plate and Sheet Manufacturers' Association**, North Hill, 2, St. James's Crescent, Swansea, Glamorgan. (Swansea 2991).

OTHER ORGANISATION

- Metal Information Bureau, Ltd.**, Princes House, 39, Jermyn Street, St. James's, London, S.W.1. (Regent 5805).

PAINTS, OILS AND VARNISHES

RESEARCH AND DEVELOPMENT ASSOCIATIONS

- London Shellac Research Bureau**, India House, Aldwych, London, W.C.2. (Temple Bar 8484).
- Research Association of British Paint, Colour and Varnish Manufacturers**, Paint Research Station, Waldegrave Road, Teddington, Middlesex (Molesey 1063).

PROFESSIONAL ASSOCIATION

- Oil and Colour Chemists Association**, 7, Whiteheads Grove, Chelsea, London, S.W.3. (Kensington 8608).

MANUFACTURERS' ASSOCIATIONS

- British Artists Colour Manufacturers' Association**, 6, Holborn Viaduct, London, E.C.1. (City 6031).
- Linoleum and Floorcloth Manufacturers' Association**, 39-41, Little Britain, London, E.C.1. (Metropolitan 8710).
- National Federation of Associated Paint, Colour and Varnish Manufacturers of the U.K.**, Paint Industry House, 79-80, High Holborn, London, W.C.1. (Holborn 7991-4).
- National Paint Federation**, Paint Industry House, 79-80, High Holborn, London, W.C.1. (Holborn 7991-4).
- Paint Manufacturers' and Allied Trades' Association**, 11a, Albemarle Street, London, W.1. (Regent 2584).

PAPER AND PRINTING

RESEARCH ASSOCIATIONS

- British Paper and Board Industry Research Association**, St. Winifred's Laboratories, Welcomes Road, Kenley, Surrey. (Uplands 6401).
- Printing and Allied Trades Research Association (PATRA)**, Charterhouse Chambers, Charterhouse Square, London, E.C.1. (Clerkenwell 8115).

MANUFACTURERS' ASSOCIATIONS

- British Federation of Master Printers**, 11, Bedford Row, London, W.C.1. (Chancery 6904).
British Wood Pulp Association, 3, Lombard Court, London, E.C.3. (Mansion House 2445).
Federation of British Printing Ink Manufacturers, Aldwych House, Aldwych, London, W.C.2. (Holborn 8245).
Federation of Master Process Engravers, Bank Chambers, 329, High Holborn, London, W.C.1. (Holborn 5746).
Paper Makers' Association of Great Britain and Ireland, Melbourne House, Aldwych, London, W.C.2. (Temple Bar 6278).
Wall Paper Manufacturers' Employers' Association, King's House, King Street West, Manchester, 3. (Blackfriars 4325).

PHARMACY

- Association of Manufacturing Chemists, Ltd.**, 14, Holborn Viaduct, London, E.C.1. (City 3691).
Association of Wholesale Druggists, 60, Artillery Lane, London, E.1. (Bishopsgate 4761).
British Schering Research Institute, Brook Lane, Alderley Edge, Cheshire. (Alderley 2021-2).
Iodine Educational Bureau, Stone House, London, E.C.2. (Bishopsgate 8321).
Pharmaceutical Society of Great Britain, 17, Bloomsbury Square, London, W.C.1. (Holborn 8967).
Pharmaceutical Society of Ireland, 67, Lower Mount Street, Dublin. (Dublin 61297).
Society of Public Analysts, *see* General.

PLASTICS

- British Plastics Federation**, 47-48, Piccadilly, London, W.1. (Regent 4681).
Institute of the Plastics Industry, Windsor House, Victoria Street, London, S.W.1. (Abbey 3895).
Society of Chemical Industry (Plastics Group), 56, Victoria Street, London, S.W.1. (Victoria 5215).

RUBBER

RESEARCH AND DEVELOPMENT ASSOCIATIONS

- British Rubber Development Board**, 19, Fenchurch Street, London, E.C.3. (Mansion House 1311-2).
British Rubber Producers' Research Association, 48, Tewin Road, Welwyn Garden City, Herts. (Welwyn Garden 933).
Research Association of British Rubber Manufacturers, 105-107, Lansdowne Road, Croydon, Surrey. (Croydon 6105).

PROFESSIONAL INSTITUTION

- Institution of the Rubber Industry**, 12, Whitehall, London, S.W.1. (Whitehall 5012).

MANUFACTURERS' AND PRODUCERS' ASSOCIATIONS

- English Rubber Thread Association**, 21, Tothill Street, London, S.W.1. (Whitehall 6711).
Federation of British Rubber and Allied Manufacturers' Associations, 43, Bedford Square, London, W.C.1. (Museum 2671).
Rubber Growers' Association (Inc.), 19, Fenchurch Street, London, E.C.3. (Mansion House 4463).
Rubber Trade Association of London, Plantation House, Mincing Lane, London, E.C.3. (Mansion House 5293).
Tyre Manufacturers' Conference, Trafalgar House, 9, Whitehall, London, S.W.1. (Whitehall 4861-2).

SCIENTIFIC INSTRUMENTS

- British Scientific Instrument Research Association**, 26, Russell Square, London, W.C.1. (Museum 2656).
Scientific Instrument Manufacturers' Association, River Plate House, 12-13, South Place, London, E.C.2. (Central 0311).
Society of Instrument Technology, 55, Tudor Gardens, London, W.3. (Acorn 1702).

TEXTILES AND ALLIED TRADES

RESEARCH AND DEVELOPMENT ASSOCIATIONS

- British Brush Manufacturers' Research Association, Ltd.**, 80, Coleman Street, London, E.C.2. (Monarch 4871).
British Cotton Industry Research Association, Shirley Institute, Didsbury, Manchester. (Didsbury 2401).
British Hat and Allied Felt Makers' Research Association, Arundel House, Arundel Street, London, W.C.2. (Temple Bar 2994).
British Jute Trade Research Association, 1, Bank Street, Dundee. (Dundee 5085).
British Launderers' Research Association, The Laboratories, Hill View Gardens, London, N.W.4. (Hendon 6111).
British Rayon Research Association, Bridgewater House, 58, Whitworth Street, Manchester, 1. (Central 3777).
Dyers and Cleaners Research Organisation, (temporary address) c/o Department of Textile Industries, The University, Leeds, 3.
Empire Cotton Growing Corporation, 1a, Harrington Road, London, S.W.7. (Kensington 9942).
Hosiery Research Council, High Street Chambers, High Street, Loughborough. (Loughborough 3079).
International Wool Secretariat, Dorland House, 18-20, Regent Street, London, S.W.1. (Abbey 4651-4658).
Lace Federation Research Council, 71, Upper Parliament Street, Nottingham. (Nottingham 3465).
Linen Industry Research Association, The Research Institute, Lambeg, Lisburn, Co. Antrim. (Lisburn 2255).
Wool Industries Research Association, Torridon, Headingley, Leeds. (Leeds 51047).

PROFESSIONAL AND LEARNED SOCIETIES

- Federation of Textile Societies and Kindred Organisations**: Hon. Sec., J. Pilkington, 146, Coppice Street, Oldham, Lancs. Ashton-under-Lyne and District Mill Managers' Association, Hon. Sec., L. Cooper, 30, Alt Road, Smallshaw, Ashton-under-Lyne; Batley and District Textile Society, Hon. Sec., N. Barker, 21, Intake Lane, Batley, Yorks.; Blackburn Textile Society, Hon. Sec., W. W. Wilkinson, Technical College, Blackburn; Bolton and District Managers', Carders' and Overlookers' Association, Hon. Sec., J. E. Horsley, 11, Orwell Road, Smithills, Bolton; Bradford Textile Society, Hon. Sec., L. W. Hustwick, 70, Kirkgate, Bradford; British Association of Managers of Textile Works, Hon. Sec., J. S. Barke, 6, John Dalton Street, Manchester; Burnley Textile Society, Hon. Sec., J. C. Walton, Glenmere, Pasturegate, Burnley, Lancs.; Bury and District Textile Society, Hon. Sec., E. Law, 10, Malvern Avenue, Bury, Lancs.; Colne and District Textile Society, Hon. Sec., T. Goth and H. S. Brooker-Carey, 7, Brown Street, West Colne, Lancs.; Cotton Mill Managers' Association, Hon. Sec., W. Palmer, 63, Moston Lane East, New Moston, Manchester, 10; Coventry Textile Society, Hon. Sec., N. E. L. Eyre, Maxtoke, Hampton Lane, Meriden, Coventry; Cumberland Textile Society, Hon. Sec., F. McKenna, 30, Percy Road, Carlisle; Derby Textile Society, Hon. Sec., A. Thompson, Textile Dept., Technical College, Normanton Road, Derby; Dewsbury Textile Society, Hon. Sec., J. Hodgson, 9, Fairfield Crescent, Staincliffe Road, Dewsbury, Yorks.; Guild of Calico Printers', Bleachers', Dyers' and Finishers' Foremen, Hon. Sec., J. Hinchley, 21, Clumber Road, Gorton, Manchester, 18; Halifax Textile Society, Hon.

Sec., E. A. Shooter, 7, Church Lane, Pellon, Halifax; Haslingden and District Textile Society, Hon. Sec., J. Wilkinson, 4, Princess Street, Haslingden, Rossendale, Lancs.; Hinckley and District Textile Society, Hon. Sec., H. J. Hall, Quornden House, Sapcote Road, Hinckley, Leics.; Huddersfield Textile Society, Hon. Sec., G. Finlayson, 17, Clare Hill, Huddersfield; Hyde and District Textile Society, Hon. Sec., J. H. Hollows, 22, Werneth Avenue, Gee Cross, Hyde, Cheshire; Leek Textile Society, Hon. Sec., H. Pegg, 121, Burton Street, Leek, Staffs.; Leicester Textile Society, Hon. Sec., A. Copley, 75, Belvoir Drive, Aylestone, Leicester; Manchester College of Technology and Social Society, Hon. Sec., Miss M. Alpe and L. Stevens, College of Technology, Sackville Street, Manchester; Morley and District Textile Society, Hon. Sec., J. C. Render, 45, Spring Avenue, Gildersome, nr. Leeds; National Federation of Textile Works Managers' Association, Hon. Sec., J. S. Barke, 6, John Dalton Street, Manchester, 2; Nelson Textile Society, Hon. Sec., H. H. Parker, 2, Spring Street, Nelson, Lancs.; Oldham and District Textile Society, Hon. Sec., P. N. Peake, 290, Frederick Street, Oldham, Lancs.; Oldham Technical Association, Hon. Sec., H. Jinks, 94, Stamford Road, Hey, Lees, Oldham, Lancs.; Preston and District Textile Society, Hon. Sec., L. Greenwood, Collinwood, 123, Ribbleson Avenue, Preston; Rochdale Cotton Spinning Mutual Improvement Society, Hon. Sec., F. Field, 29, Ipswich Street, Rochdale; Todmorden Textile Society, Hon. Sec., J. A. Schofield, 13, Horefield Avenue, Todmorden, Yorks.; Textile Teachers, Lancs. Section, Hon. Sec., O. Pomfret, 213, Bolton Road West, Ramsbottom, Lancs.; Textile Teachers, Yorks. Section, Hon. Sec., A. Brearley, 43, Haugh Shaw Road, Halifax; Textile Institute, Lancs. Section, Hon. Sec., H. C. Barnes, 75, Mellor Road, Ashton-under-Lyne; Textile Institute, Yorks. Section, Hon. Sec., R. G. Oversby, 365, Sticker Lane, Bradford; Keighley Textile Society, Hon. Sec., J. W. Leach, Brooklands, Cranby Drive, Riddlesden, Keighley; Rochdale Textile Society, Hon. Sec., W. Mooney, 14, Abingdon Street, Rochdale; Shipley Textile Society, Hon. Sec., F. H. W. Bennett, c/o Technical School, Shipley, Yorks.

Institution of British Launderers, Ltd., 16-17, Lancaster Gate, London, W.2. (Paddington 2454-2456).

Society of Dyers and Colourists, 32-34, Piccadilly, Bradford. (Bradford 4519).

Society of Laundry Engineers, *see* Engineering.

Textile Institute, 16, St. Mary's Parsonage, Manchester, 3. (Blackfriars 1457).

ASSOCIATIONS OF MANUFACTURERS, PRODUCERS, ETC.

Allied Association of Bleachers, Dyers, Printers and Finishers, 2, Cooper Street, Manchester. (Central 5359).

Bleachers' Association, Ltd., Blackfriars House, Parsonage, Manchester, 3. (Blackfriars 8181). Research Laboratories, "Wood End", Grange Road, Bromley Cross, Bolton. (Eagley 256).

Bleachers' and Finishers' Association, 52, Donegall Place, Belfast. (Belfast 21471).

Bradford Dyers' Association, Ltd., 39, Well Street, Bradford. (Bradford 3800).

British Cotton Growing Association, 333-350, Royal Exchange, Manchester, 2. (Blackfriars 2732).

British Felt Hat Manufacturers' Federation, Crown Point, Denton, nr. Manchester. (Denton 2091).

British Rayon Federation, Bridgewater House, 58, Whitworth Street, Manchester, 1. (Central 3777).

Carpet Manufacturers' Association, 66, Coleman Street, London, E.C.2. (Monarch 3801).

Confederation of Textile Dyers and Finishers, 2, Cooper Street, Manchester, 2. (Central 5359).

Cotton Spinners' and Manufacturers' Association, Midland Bank House, 26, Cross Street, Manchester. (Deansgate 2712).

Federation of Lace and Embroidery Employers' Associations, Smithy Row, Nottingham. (Nottingham 2851).

Federation of Master Cotton Spinners' Associations, Ltd., 68-70, Deansgate Arcade, Deansgate, Manchester, 3. (Blackfriars 7871).

Flax Spinners' Association, Ltd., 7, Donegall Square West, Belfast. (Belfast 24824).

- Flax Supply Association**, 7, Donegall Square West, Belfast. (Belfast 24824).
Harris Tweed Association, Ltd., Salisbury House, London Wall, London, E.C.2. (Monarch 9235).
Lace Machine Builders' and Allied Trades Association, 9, Low Pavement, Nottingham. (Nottingham 44027).
National Federation of Bedding and Allied Trades, Ltd., 19-21, Hatton Garden, London, E.C.1. (Holborn 4151).
National Federation of Dyers and Cleaners, Norfolk House, 7, Laurence Pountney Hill, Cannon Street, London, E.C.4. (Mansion House 1221).
National Hosiery Manufacturers' Association, 104, Regent Road, Leicester. (Leicester 20712-3-4).
Rayon Weaving Association, The, Fountain House, 81, Fountain Street, Manchester, 2. (Central 7601-2).
Silk and Rayon Users' Association (Inc.), 229-231, High Holborn, London, W.C.1. (Holborn 6856).
Wholesale Clothing Manufacturers' Federation of Great Britain, 7, Cavendish Square, London, W.1. (Langham 1852).
Wholesale Textile Association, 75, Cannon Street, London, E.C.4. (City 4444).
Wool Textile Delegation, Lloyds Bank Chambers, Hustlergate, Bradford. (Bradford 982).

OTHER ORGANISATIONS

- British Colour Council**, 13, Portman Square, London, W.1. (Welbeck 4185).
Cotton Board, Midland Bank Buildings, Spring Gardens, Manchester. (Blackfriars 2573).
Cotton Board Colour, Design and Style Centre, 17a, York Street, Manchester, 2. (Central 1121).
Liverpool Cotton Association, Ltd., Cotton Exchange Buildings, Liverpool, 3. (Central 6041).
Manchester Cotton Association, Ltd., 330, Royal Exchange, Manchester, 2.

MISCELLANEOUS

- Advisory Committee on Airborne Research Facilities**, Royal Society, Burlington House, London, W.1.
Anti-Locust Research Centre, British Museum (Natural History), Cromwell Road, London, S.W.7. (Kensington 6323).
Association of British Picture Restorers, 3, Dudley House, 169, Piccadilly, London, W.1. (Regent 2280).
British Film Institute, 4, Great Russell Street, London, W.C.1. (Museum 0607).
British Institute of Radiology, 32, Welbeck Street, London, W.1. (Welbeck 6237).
British Mycological Society, (Hon. Sec., G. C. Ainsworth) The Wellcome Physiological Research Laboratories, Belmont Laboratories, Ventnor Road, Sutton, Surrey. (Vigilant 0584).
British Optical Association, 65, Brook Street, London, W.1. (Mayfair 3382).
British Waterworks Association, 34, Park Street, London, W.1. (Grosvenor 1092-3).
Council of Tobacco Manufacturers of Great Britain and Ireland, *see* Federation of Home and Export Tobacco Manufacturers Ltd.
Federation of Home and Export Tobacco Manufacturers Ltd., 69, Cannon Street, London, E.C.4. (City 4444).
Geological Society of London, Burlington House, Piccadilly, London, W.1. (Regent 2356).
Institute of Quarrying, Salisbury House, Fleet Street, London, E.C.4. (Central 8918).
International Co-operative Alliance, 14, Great Smith Street, London, S.W.1. (Abbey 7487).
Mineralogical Society, British Museum (Natural History), South Kensington, London, S.W.7. (Kensington 6323).
National Jewellers' Association, 38, Parliament Street, London, S.W.1. (Whitehall 4606).

- National Sulphuric Acid Association, Ltd.**, 166, Piccadilly, London, W.1. (Regent 1440).
Royal Photographic Society of Great Britain, 16, Princes Gate, Kensington, London, S.W.7. (Kensington 3334).
Royal Sanitary Association of Scotland, 185, St. Vincent Street, Glasgow. (Central 3345-6).
Scottish Seaweed Research Association, West Mains Road, Edinburgh, 9.
Toilet Preparations and Perfumery Manufacturers' Federation of Great Britain, Ltd., 69, Cannon Street, London, E.C.4. (City 4444).

THE CITY GUILDS (LIVERY COMPANIES)*

- Worshipful Company of Armourers and Brasiers**, 81, Coleman Street, London, E.C.2.
Worshipful Company of Bakers, 116, Cannon Street, London, E.C.4.
Worshipful Company of Carpenters, 28, Austin Friars, London, E.C.2. (London Wall 4793).
Worshipful Company of Clockmakers, 116, Cannon Street, London, E.C.4.
Worshipful Company of Clothworkers, 48, Fenchurch Street, London, E.C.3. (Mansion House 6336).
Worshipful Company of Coachmakers, 8, Lincoln's Inn Fields, London, W.C.2.
Worshipful Company of Cordwainers, 329, High Holborn, London, W.C.1. (Holborn 6789).
Worshipful Company of Cutlers, Cutlers' Hall, Warwick Lane, London, E.C.4.
Worshipful Company of Drapers, Throgmorton Street, London, E.C.2.
Worshipful Company of Dyers, 10, Dowgate Hill, London, E.C.4.
Worshipful Company of Farriers, 80, Bishopsgate, London, E.C.2. (London Wall 3081).
Worshipful Company of Feltmakers, Arundel House, Arundel Street, London, W.C.2. (Temple Bar 2994).
Worshipful Company of Founders, 13, St. Swithin's Lane, London, E.C.4.
Worshipful Company of Glaziers, 1, Garden Court, London, E.C.4.
Worshipful Company of Goldsmiths, Goldsmiths' Hall, Foster Lane, London, E.C.2. (Monarch 1668).
Worshipful Company of Grocers, Princes Street, London, E.C.2. (Monarch 3687-8).
Worshipful Company of Ironmongers, Shaftesbury Place, Aldersgate, London, E.C.1.
Worshipful Company of Leathersellers, St. Helen's Place, London, E.C.3. (London Wall 4615).
Worshipful Company of Paviers, 789, Salisbury House, London, E.C.2.
Worshipful Company of Plaisterers, 9, Stone Buildings, London, W.C.2.
Worshipful Company of Salters, Salters' Hall, St. Swithin's Lane, London, E.C.4. (Mansion House 5193).
Worshipful Company of Shipwrights, Baltic Exchange Chambers, 24, St. Mary Axe, London, E.C.3. (Avenue 6782).
Worshipful Company of Skinners, 8, Dowgate Hill, London, E.C.4.
Worshipful Company of Spectacle Makers, Apothecaries' Hall, Black Friars Lane, London, E.C.4.
Worshipful Company of Stationers and Newspaper Makers, Stationers' Hall, London, E.C.4. (City 2934).
Worshipful Company of Tin Plate Workers, 3, Albany Court Yard, London W.1.
Worshipful Company of Vintners, Upper Thames Street, London, E.C.4.

* This list does not include all the City Guilds, but only those which are actively concerned in promoting industrial research and/or technical education; these activities are described in *Industrial Research and Development* by Sir H. Frank Heath and A. L. Hetherington, Chapter 37 and Appendix VI (see Books Section, under General). A complete list of the City Guilds is to be found in *Whitaker's Almanack*.

University Laboratories

UNIVERSITY OF ABERDEEN

PHYSICS LABORATORY

Nature of Research : Delicate instrumentation. The solid state. Radiology.

Special Apparatus and Facilities : Precision workshop.

Application concerning research should be made to : The Professor of Natural Philosophy.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Physical chemistry of high polymers ; kinetics of gas reactions.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : The Professor of Chemistry.

CIVIL ENGINEERING LABORATORY

Nature of Research : Stress measurements by electric strain gauge and photo-elastic methods of stress determination ; hydraulic scale models ; soil mechanics.

Special Apparatus and Facilities : Polariscope and multiple-way electric strain gauge apparatus. Other facilities in course of preparation.

Application should be made to : The Professor of Engineering.

UNIVERSITY OF BIRMINGHAM

PHYSICS DEPARTMENT : Poynting and Nuffield Laboratories.

Nature of Research : Nuclear physics ; solid state ; biophysics.

Special Apparatus and Facilities : 60 inch cyclotron ; synchrotron for 1,000,000,000 volt protons.

Relations with Industry : Close relations with electrical industry and other local industries, but no investigation directly of industrial problems.

Application concerning research should be made to : Prof. M. L. Oliphant, Professor of Physics.

ELECTRON PHYSICS DEPARTMENT : Electron Physics Laboratory.

Nature of Research : Fundamental reactions in ionised gases, including : electrical recombination ; interaction of micro-waves with ionised gases ; the properties of very high current gas discharges.

Relations with Industry : The Electron Physics section in this University is a new activity and the details of relations with industry have not yet taken shape, but it is intended that there shall be close co-operation.

Application should be made to : Prof. J. Sayers, Professor of Electron Physics.

ORGANIC AND BIOLOGICAL CHEMISTRY DEPARTMENT : The A. E. Hills Laboratories and the Frankland Laboratory.

Nature of Research : Fundamental chemistry of the carbohydrates with special reference to their structure, functions and synthesis ; transformation of sugars and starches into products in general use ; chemotherapeutic agents ; chemistry of micro-organisms ; chemistry in relation to medicine, with special reference to cancer, tuberculosis, blood transfusion, etc. ; chemistry of natural products, including nucleoproteins ; organic fluorine compounds ; radioactive isotopes and chemical and biological research ; chemistry of high polymers and elastomers.

Special Apparatus and Facilities : The department possesses most of the equipment needed for research on these problems and has recently spent a considerable sum on the complete reconditioning and modernisation of the laboratories. Modern micro-analytical laboratories, and bacteriological chemistry laboratories and laboratories for high vacuum work are available for special research. On the biological side close collaboration is maintained with the University Medical School Laboratories and other University laboratories.

A large research school is engaged on a variety of problems.

Relations with Industry : Industry provides research grants. Fundamental research is carried out for the Government, e.g. for the Colonial Products Research Council, the Ministry of Supply (Atomic Energy Department), and the Admiralty. Results of fundamental research may be communicated to industry but no special problems are investigated.

Application should be made to : Prof. Sir Norman Haworth, F.R.S., Director of the Department of Chemistry.

INORGANIC CHEMISTRY DEPARTMENT

Nature of Research : Chemistry in relation to atomic energy; micro-chemical analysis; organo-metallic compounds; polarographic studies of inorganic compounds.

Special Apparatus and Facilities : Well-equipped research laboratories are available, including polarograph, spectrographic apparatus, etc.

Relations with Industry : Industry provides research grants and apparatus.

Application should be made to : Prof. Sir Norman Haworth, F.R.S., Director of the Department of Chemistry.

PHYSICAL CHEMISTRY DEPARTMENT : The Frankland Laboratory.

Nature of Research : X-ray and crystallographic studies; methods for determining the molecular size of high polymers and elastomers, including ultracentrifuge and osmotic pressure measurements; kinetics of electro-chemical processes; kinetics of halogenation; physical chemistry of biologically significant molecules.

Special Apparatus and Facilities : A modern ultracentrifuge and a new type of apparatus for measuring osmotic pressure of large molecules; well-equipped x-ray and crystallography laboratories; ultra-violet absorption apparatus, polarimeters, etc.; a Tiselius apparatus is being installed.

The Physical Chemistry Department has been greatly extended and there is now a large research school.

Relations with Industry : Industry provides research grants and apparatus.

Application should be made to : Prof. Sir Norman Haworth, F.R.S., Director of the Department of Chemistry.

MALTING, BREWING AND INDUSTRIAL FERMENTATION DEPARTMENT : William Waters Butler Laboratories.

Nature of Research : Industrial biochemical research, comprising in particular: brewing materials and processes; nutrition of yeast; the functions of the amylases; vitamins and growth factors in foodstuffs, etc.

Special Apparatus and Facilities : A laboratory scale experimental brewery; instruments particularly associated with the above items of research, e.g. polarimeters, photometers, centrifuges, etc.

Relations with Industry : Research on brewing materials and processes and on nutrition of yeast is financed by the Institute of Brewing, which draws its revenue for such purposes from the brewing industry.

Application should be made to : Prof. R. H. Hopkins, Professor of Brewing and Industrial Fermentation.

CIVIL ENGINEERING DEPARTMENT : Civil Engineering Laboratories, including Strength of Materials, Structures, Hydraulic and Concrete Laboratories.

Nature of Research : Mainly on metal and reinforced concrete structures.

Special Apparatus and Facilities : Testing machines ranging from 10 tons to 500 tons, including Avery 300 ton machine which can be used for testing structures of considerable size; special laboratory for experimental work on concrete and reinforced concrete structures.

Relations with Industry : The Department has carried out investigations for the Steel Structures Research Committee (D.S.I.R.), research associations, public bodies and industrial firms.

Application should be made to : Prof. C. Batho, D.Sc., M.I.C.E., Professor of Civil Engineering.

MECHANICAL ENGINEERING DEPARTMENT

Nature of Research : Investigation of discharge processes accompanying the sudden release of compressed gas from a cylinder; investigation of reactions on piston-type control valves for high-pressure hydraulic circuits; investigation of high-speed piston ring flutter in internal combustion engines.

Special Apparatus and Facilities : The laboratories are in process of being re-built and re-equipped.

Application should be made to : Prof. G. F. Mucklow, Professor of Mechanical Engineering.

ELECTRICAL ENGINEERING DEPARTMENT

Nature of Research : Investigation of the "Luxemburg" interference effect in radio transmission and its implications in respect of the constitution of the ionosphere ; conductivity through dielectrics on steeply rising electrical stress ; iron losses under pulse magnetisation ; the air-gap magnetic field of inductor alternators ; the sources of error in permeammeters.

Special Apparatus and Facilities : Ordinary teaching laboratory equipment, and requirements for current researches above, with exceptional facilities for work on wave guides.

Relations with Industry : Close personal relations with large electrical engineering firms in the Midlands.

Application should be made to : Prof. A. Tustin, Professor of Electrical Engineering.

CHEMICAL ENGINEERING DEPARTMENT

Nature of Research : Combustion processes, particularly pre-flame reactions, in spark ignition, compression ignition and jet engines ; constitution of coal and products derived therefrom, together with processing of coal ; synthesis of pure hydrocarbons and determination of other physical properties, particularly magnetic rotatory dispersion ; determination of absolute viscosity of pure compounds, and the rheological characteristics of certain non-Newtonian materials ; unit operations in chemical engineering, particularly extractive and azeotropic distillation.

Special Apparatus and Equipment : Large-scale flow apparatus for non-Newtonian materials ; chemical engineering equipment for investigation of unit processes ; various types of engines and equipment for the investigation of combustion phenomena in spark ignition and compression ignition engines.

Application should be made to : Prof. F. H. Garner, Professor of Chemical Engineering.

METALLURGY AND INDUSTRIAL METALLURGY DEPARTMENT

Nature of Research : Research covers a wide range, from fundamental theoretical work to problems of immediate interest to industry. Emphasis is laid on non-ferrous metallurgy, but ferrous metallurgy is also represented. Groups of research workers are investigating : the application of modern theoretical physics to metallurgy, and the development of the general theory of alloy formation ; the fundamental aspects of deformation and creep of metals and alloys ; the nature of deformed metals, and the application of specialised x-ray techniques to the problem. Close liaison is maintained between these groups, with a view to the elucidation of the effect of various factors, known to be important in alloy formation, on the mechanical properties of alloys. Work is also in progress on : the investigation of the causes of "hot shortness" in light alloys, in connection with welding problems ; the influence of internal strains due to phase transformations on the welding of steel ; the influence of various factors on the casting properties of bronzes, and the constitution of certain of these alloys.

Special Apparatus and Facilities : Equipment for physical work on the constitution and mechanical properties of alloys ; special apparatus for the growth and investigation of single crystals ; a variety of x-ray cameras, including a single crystal goniometer, and a high-temperature powder camera ; a special Geiger-counter x-ray spectrometer is under construction.

A new laboratory for the School of Industrial Metallurgy to house many large scale items of industrial equipment, is being built, and will give facilities for research on a semi-industrial scale.

Relations with Industry : Facilities are generally available for work on industrial problems by arrangement with the Professors.

Application should be made to : Prof. D. Hanson, Professor of Metallurgy and Director of Department (general), and Prof. L. Aitchison (industrial).

MINING DEPARTMENT

Nature of Research : Dust, gas and heat in mines ; mine lighting ; mine ventilation ; spontaneous combustion underground ; mine rescue ; ore dressing.

Special Apparatus and Facilities : Special facilities for work connected with the above subjects and for allied mining subjects.

Relations with Industry : Special arrangements may be made for investigations of problems connected with coal mining, metalliferous mining and ore dressing.

Application should be made to : Prof. T. David Jones, Mining Department.

UNIVERSITY OF BRISTOL

PHYSICS LABORATORY : H. H. Wills Physics Laboratory.

Nature of Research : Theoretical physics ; physics.

CHEMISTRY LABORATORY

Nature of Research : Inorganic, organic, and physical chemistry.

ENGINEERING LABORATORIES

Nature of Research : Civil, electrical, mechanical and aeronautical engineering.

Special Apparatus and Facilities : Facilities for research are available for the above Departments.

Application concerning research should be made to : The Registrar, University of Bristol.

UNIVERSITY OF CAMBRIDGE*

EXPERIMENTAL PHYSICS : Cavendish Laboratory.

Nature of Research : A wide range of physical subjects, including atomic and molecular physics, radioactivity, properties of matter, optics, magnetism and radio-telegraphy.

Special Apparatus and Facilities : Equipment for research in all branches of physics ; a large plant for the production of liquid air. There is also a library.

Cavendish Professor of Experimental Physics : Prof. Sir W. L. Bragg, M.A., Trinity College.

CHEMISTRY LABORATORIES

Special Apparatus and Facilities : Six large laboratories for elementary and advanced work, and a number of well-equipped smaller rooms chiefly devoted to research in organic chemistry. The draught chambers are ventilated by powerful electric fans, and good facilities are provided for work with poisonous vapours. The building contains several dark rooms for photographic and optical work, and fireproof rooms in which experiments requiring long continued heating can be conducted. There is also a roof laboratory where experiments can be carried out in open air and direct sunlight.

The machinery room contains a dynamo, a battery of storage cells, freezing plant, etc. Supplies of liquid air can be obtained from the neighbouring central power-plant for air liquefaction. Electric power is available throughout the building.

The laboratory possesses a useful reference library containing the most important British and some foreign chemical journals, as well as a selection of the chief works of reference, and provision is also made for the use of the Philosophical Library and the University Library, which possesses the chief foreign chemical treatises, in addition to books published in the U.K.

John Humphrey Plummer Professor of Theoretical Chemistry : Sir J. E. Lennard-Jones, Ph.D., Corpus Christi College.

Professor of Organic Chemistry : Prof. A. R. Todd, M.A., Christ's College.

Professor of Inorganic Chemistry : Prof. H. J. Emeléus, M.A., Sidney Sussex College.

* The regulations relating to research students can be obtained in pamphlet form from the Secretary of the Board of Research Studies, at the Registry of the University, Cambridge.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Spectroscopic work in the visible, infra-red, and ultra-violet regions of the spectrum, and in the x-ray examination of crystals.

Special Apparatus and Facilities : A large, general laboratory, special laboratories for optical and electrical experiments, research laboratories for the Professor and Lecturer and accommodation for about 24 research students.

Professor of Physical Chemistry : Prof. R. G. W. Norrish, Sc.D., Emmanuel College.

METALLURGICAL LABORATORIES (Chemical Department).

Special Apparatus and Facilities : The Metallurgical Laboratories include a laboratory for metallography and for assaying. New equipment has been installed for the melting and working of metals with electric furnaces for high temperature investigations. Several rooms in other parts of the building are devoted to corrosion research.

Goldsmiths' Professor of Metallurgy : Prof. G. W. Austin, M.A.

Reader in the Science of Metallic Corrosion : U. R. Evans, Sc.D., King's College.

COLLOID SCIENCE LABORATORIES

Special Apparatus and Facilities : The Department of Colloid Science is closely associated with the Chemical Laboratory. Accommodation is provided for about 16 research students in six research laboratories, and provision has been made for further extensions. The laboratories are equipped with all facilities for research in the various fields of surface action and colloids. There is a dark room for ultra-microscopic investigations, and two research rooms for photo-chemical research and investigations in precision calorimetry.

John Humphrey Plummer Professor of Colloid Science : Chair vacant.

CRYSTAL CHEMISTRY LABORATORIES

Nature of Research : Crystal structure of chemical substances and metals.

Special Apparatus and Facilities : In collaboration with the Department of Mineralogy x-ray apparatus of the most modern type has been installed, and other facilities are available for the above work.

MINERALOGICAL LABORATORIES

Special Apparatus and Facilities : The mineral collection in the Mineralogical Department is very extensive, and ranks after that of the British Museum as one of the most complete in the country. It contains much material suitable for research. The laboratories are equipped with modern apparatus designed for the investigation of crystals, including one and two circle goniometers, total reflectometers, monochromatic illuminator, microscopes, section cutting and grinding machinery, etc. The chemical laboratory is specially fitted up for rock and mineral analysis, and there is a good departmental library.

Professor of Mineralogy and Petrology : Prof. C. E. Tilley, Ph.D., Emmanuel College.

FACULTY OF ENGINEERING

Special Apparatus and Facilities : For laboratories, see below. The Faculty library contains the proceedings of the principal English engineering societies, and the most important technical periodicals and books.

Professor of Mechanical Sciences : Prof. J. F. Baker, Sc.D., Clare College.

HEAT ENGINE LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : Gas engines (one fitted with a producer plant), oil engines, a German submarine six-cylinder Diesel engine of 550 H.P., a 50 H.P. Diesel engine, a small Laval and a 30 k.w. Parsons turbine, several steam engines, including a Uniflow engine and a Robey compound, three refrigerating plants, a specially designed Ricardo variable-compression-testing unit, and two small air-compressors. All the prime movers are fitted either with brakes or with direct-driven dynamos, and each is equipped with measuring appliances, such as exhaust calorimeters, etc. The Boiler House contains three boilers, one fitted with a chain grate and the two others adapted for either coal or oil fuel.

STRUCTURES AND TESTING OF MATERIALS LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : Seven testing machines, the largest of 50 tons capacity, a hydraulic press and riveting machine, a special strut-tester, and many special pieces of apparatus, such as Brinell hardness-testers, an Izod impact-testing machine, alternating stress machines, and apparatus for cement and concrete testing.

HYDRAULIC LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : Two motor-driven centrifugal pumps delivering to an overhead tank of 20,000 gallons capacity, which supplies a turbine and Pelton wheel as well as the usual pipes, weirs and orifices, all fitted with suitable measuring apparatus; also a Pelton wheel for large head supplied direct from a centrifugal pump and motor.

FERROUS METALLURGICAL LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : Microscopes, photomicrographic outfit, polishing and etching apparatus, gas and electric furnaces, thermo-couple radiation and resistance pyrometers, as well as a thread-recorder, and other self-recording apparatus. A small chemical laboratory is equipped for the analysis of all steel works materials.

ELECTRICAL LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : The usual outfit of direct, mono-, two- and three-phase machines and motors, including a rotary converter and induction motors. There is a very full and complete outfit of measuring instruments, including an oscillograph, and also a model of a long power line.

WIRELESS LABORATORY (Faculty of Engineering).

Special Apparatus and Facilities : Two aeriels and an earth connection are provided; and there is a quantity of measuring apparatus, condensers, inductances, and components for assembling, transmitting and receiving arrangements of all kinds. Various D.C. and A.C. supply voltages are available for thermionic work.

Professor of Electrical Engineering : Prof. E. B. Moullin, Sc.D., King's College.

AERONAUTICAL DEPARTMENT (Faculty of Engineering).

Nature of Research : Problems relating to the two-dimensional flow of fluids of small viscosity.

Special Apparatus and Facilities : Special apparatus for this purpose is being developed.

Francis Mond Professor of Aeronautical Engineering : Sir B. M. Jones, M.A., Emmanuel College.

PHARMACOLOGY AND EXPERIMENTAL MEDICINE LABORATORY (Faculty of Medicine).

Nature of Research : At present most of the research deals with the wider branch of experimental medicine.

Special Apparatus and Facilities : The laboratory is equipped for research both on the chemical and physiological side, and provides every facility for those working for higher degrees, especially the M.D. and Ph.D.

Professor of Experimental Medicine : Prof. R. A. McCance, M.D., Sidney Sussex College.

Shield Professor of Pharmacology : Prof. E. B. Verney, M.A., M.B., B.Chir., Downing College.

UNIVERSITY OF DURHAM**King's College, Newcastle upon Tyne****PHYSICS DEPARTMENT**

Nature of Research : Fluid motion; sound (especially supersonics); spectroscopy.

Special Apparatus and Facilities : Large quartz and other spectrographs; reflecting Echelon and variable Fabry-Perot interferometers; recording microphotometer.

Application concerning research should be made to : Prof. W. E. Curtis, D.Sc., F.R.S.

CHEMISTRY DEPARTMENT

Nature of Research : (i) Determination of the structures of natural products, especially in the alkaloid and terpene fields. (ii) The synthesis of compounds for testing as possible chemotherapeutic reagents. (iii) The organic chemistry of deuterium. It is hoped to extend this work shortly to isotopes of other elements. In connection with the above fundamental researches and arising out of them, special researches are under investigation for the Colonial Products Research Council, the Medical Research Council, for two of the largest groups in I.C.I., and the Rubber Research Association.

Special Apparatus and Facilities : Spectrographs, a first-rate polarimeter, etc. Micro-analytical work in connection with researches has been carried on since 1927.

Relations with Industry : Close relations and exchange of visits between industrial and university research laboratories.

Application should be made to : Prof. G. R. Clemo, Ph.D., D.Sc., D.Phil., F.R.S., F.C.S., F.I.C.

CIVIL ENGINEERING DEPARTMENT

Nature of Research : Torsional constant of rolled steel sections ; work for the Cement and Concrete Association on effects of dispersal agents and other admixtures in concrete, and on the setting of concrete at low temperatures ; work for a Research Group of the Institution of Water Engineers on the filterability of water and the characteristics of filters.

Special Apparatus and Facilities : Laboratory is well equipped for experimental work on concrete and soil mechanics.

Relations with Industry : Many industrial tests are made for acceptance and control of concrete materials. Routine tests of concrete cubes. Soil mechanics tests for building, road, bridge and runway foundations.

Application should be made to : Prof. W. Fisher Cassie, Ph.D., M.S., A.M.I.C.E., M.I.Struct.E.

ELECTRICAL ENGINEERING DEPARTMENT

Nature of Research : (i) The characteristics of synchronous governors. (ii) Circuit rupturing by sliding contacts. (iii) Vacuum-tube circuits and applied electronics.

Relations with Industry : Much work of industrial interest is carried out in the laboratories.

Application should be made to : (i) and (ii) to Prof. J. C. Prescott, D.Eng. ; (iii) to Dr. E. Williams, B.Eng., Ph.D.

MECHANICAL ENGINEERING DEPARTMENT

Nature of Research : Internal combustion engines, gas turbines and heat transmission ; experimental stress analysis using electric resistance strain gauges.

Relations with Industry : Routine tests are carried out for various local firms, and research work for the British Shipbuilding Research Association.

Application should be made to : Prof. A. F. Burstall, Ph.D., D.Sc., M.I.Mech.E.

MINING DEPARTMENT

Nature of Research : Ventilation-pressures, velocities, fans, natural ventilation, etc. Mine dust and gas, disease, safety factors, etc. Research on separation, treatment, etc. of various minerals, e.g. galena, pyrites, witherite, fluorspar.

Special Apparatus and Facilities : Experimental axial-flow fan in laboratory ; differential monometer reading to 0.001 in. W.G. inclined gauge, velometer and other ventilation surveying instruments for photographic determination of sectional areas. Full scale mineral dressing plant in laboratory. Special gas sampling device and gas analysis apparatus. Konimeter for measurement of dust concentrations. Polaroid apparatus for photo-elastic stress analysis in course of development. Equipment for detailed mine water analysis. Photo-electric colorimeter.

Relations with Industry : The Department is consulted by colliery companies, Ministry of Fuel and Power, etc., and research facilities are available at collieries.

Application should be made to : Prof. Granville Poole, B.Sc., F.G.S., M.I.M.E.

METALLURGY DEPARTMENT

Nature of Research : Stress-corrosion ; heat and creep-resistance of cast irons ; constitution of aluminium alloys.

Special Apparatus and Facilities : X-ray diffraction and radiography ; gas, high frequency and arc electric furnace equipment for melting and heat treatment ; welding, rolling and forging equipment ; spectrographs, etc.
Relations with Industry : Close association through Metallurgy Advisory Committee.
Application should be made to : Prof. C. E. Pearson, M.Met., F.I.M.

NORTHERN COKE RESEARCH LABORATORY

Nature of Research : Investigations into the properties of coke and coal especially metallurgical coke.
Special Apparatus and Facilities : X-ray diffraction. High temperature furnaces and other apparatus for investigating coal and coke.
Relations with Industry : The British Coke Research Association and other allied industrial firms subsidise fundamental research into the nature of coking coals, carbonisation, etc. The College is advised by the Northern Coke Research Committee, made up of technical and scientific experts from the carbonisation industries.
Application should be made to : Prof. H. L. Riley, A.R.C.S., D.Sc., D.I.C., F.R.I.C., F.C.S.

UNIVERSITY OF EDINBURGH

PHYSICS LABORATORY : Department of Physics.

Nature of Research : Nuclear physics, in particular β -ray spectroscopic work.

Application concerning research should be made to : Prof. N. Feather, B.A., B.Sc., Ph.D., F.R.S.

MATHEMATICAL PHYSICS LABORATORY : Department of Mathematical Physics.

Nature of Research : Quantum theory of the solid state.

Application should be made to : Prof. Max Born, M.A., Dr.Phil., Sc.D., F.R.S., F.R.S.E.

ORGANIC CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : Co-operation in research on seaweed products.

Application should be made to : Prof. J. P. Kendall, M.A., D.Sc., F.R.S.

INORGANIC CHEMISTRY LABORATORY : Technical chemistry.

Nature of Research : Synthetic oils.

Application should be made to : Dr. D. Bain.

ENGINEERING LABORATORY : Department of Engineering.

Nature of Research : Vibration, in cutting metal, and in structural foundations.

Application should be made to : Prof. R. N. Arnold, D.Sc., Ph.D., M.I.Mech.E.

MINING LABORATORY : Department of Mining.

Nature of Research : Underground illumination and ventilation.

Application should be made to : Professor W. H. McMillan, B.Sc., M.I.Min.E., F.Inst.F., F.Inst.Pet., F.R.S.E.

Relations of the University with Industry : There is a Chair of Organisation of Industry and Commerce, held by Prof. W. Oliver, and his Department acts as a liaison between industrial and academic interests.

UNIVERSITY COLLEGE OF THE SOUTH WEST, EXETER.

PHYSICS LABORATORY : Washington Singer Laboratories.

Nature of Research : Conduction of electricity in gases. Spectroscopy.

Application concerning research should be made to : Prof. F. H. Newman, Ph.D., D.Sc., A.M.I.E.E., F.Inst.P.

ORGANIC CHEMISTRY LABORATORY : Washington Singer Laboratories.

Nature of Research : Research is being started on nitrogen heterocyclic chemistry, having possible chemotherapeutic value.

Application should be made to : Dr. K. Schofield.

INORGANIC CHEMISTRY LABORATORY : Washington Singer Laboratories.
Nature of Research : Physico-chemical investigations of : complex formation ; heteropoly acids ; the chemistry of the rarer elements ; electro-deposition of metals ; the precipitation of sparingly soluble substances, *e.g.*, hydroxides ; redox and other potentiometric titrations.

Application should be made to : Prof. H. T. S. Britton, D.Sc., F.R.I.C.

PHYSICAL CHEMISTRY LABORATORY : Washington Singer Laboratories.
Nature of Research : Investigation of : the adsorption of gases by solids ; the surface properties of active powders.

Application should be made to : Dr. S. J. Gregg.

UNIVERSITY OF GLASGOW

PHYSICS LABORATORY : Natural Philosophy Institute.

Nature of Research : Mainly nuclear and atomic physics.

Special Apparatus and Facilities : Under development.

Application concerning research should be made to : Prof. P. I. Dee, F.R.S.

ORGANIC CHEMISTRY LABORATORY : Chemistry Department.

Nature of Research : Structure of natural products ; synthetic drugs ; molecular rearrangement ; stereochemistry.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. J. W. Cook, F.R.S.

INORGANIC CHEMISTRY LABORATORY : Chemistry Department.

Nature of Research : Preparation and structure of complex salts ; methods of analysis.

Application should be made to : Dr. J. A. Mair.

PHYSICAL CHEMISTRY LABORATORY : Chemistry Department.

Nature of Research : X-ray diffraction studies of crystalline materials ; photochemical work ; dipole moments ; surface tension ; general physical chemistry.

Special Apparatus and Facilities : Optical and x-ray equipment and general physico-chemical apparatus.

Application should be made to : Prof. J. M. Robertson, F.R.S.

METALLURGICAL LABORATORY : The metallurgical work associated with the University is carried on at the Royal Technical College, Glasgow.

Application should be made to : Prof. R. Hay, Royal Technical College, Glasgow.

CIVIL ENGINEERING AND MECHANICS LABORATORY : James Watt Engineering Laboratory.

Nature of Research : Strength and elasticity, overstrain and fatigue of metals ; welding ; fluid flow and silt transportation ; soil mechanics.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. G. Cook, F.R.S.

ELECTRICAL ENGINEERING LABORATORY : James Watt Engineering Laboratory (Electrical Engineering Department).

Nature of Research : General electrical engineering problems, including radio.

Special Apparatus and Facilities : Accommodation and facilities very restricted at present.

Application should be made to : Prof. B. Hague, D.Sc.

HEAT ENGINES LABORATORY : The James Watt Laboratory (Heat Engines Section).

Nature of Research : Thermodynamic properties of combustion gases in engines and turbines ; fuel ignition ; boiler corrosion ; heat transfer and drying problems.

Application should be made to : Prof. James Small, D.Sc.

MINING LABORATORY : Work in mining is dealt with by the Royal Technical College, Glasgow.

Application should be made to : Prof. G. Hibberd, Ph.D.

Relations of the University with Industry : Work has been undertaken at the suggestion of local industrialists.

UNIVERSITY COLLEGE, HULL

PHYSICS LABORATORY

Nature of Research : Wireless ; electrical and optical properties of materials at ultra-high frequencies ; cavity resonators.

Special Apparatus and Facilities : Radio Research Laboratory.

Application should be made to : The Professor of Physics.

ORGANIC AND PHYSICAL CHEMISTRY LABORATORIES

Nature of Research : Studies of reaction kinetics in solution. Problems in aromatic substitution.

Application should be made to : The Professor of Chemistry.

UNIVERSITY OF LEEDS

PHYSICS AND CHEMISTRY LABORATORIES**CIVIL, MECHANICAL AND ELECTRICAL ENGINEERING LABORATORIES**

Special Apparatus and Facilities : The equipment in all the main laboratories affords opportunities for research work, while a number of smaller laboratories have been equipped with extensive research appliances for individual work in many of the branches of engineering.

Application concerning research should be made to : The Head of the Department.

DEPARTMENT OF COAL, GAS AND FUEL INDUSTRIES WITH METALLURGY

Nature of Research : The carbonisation and gasification of coal ; metallurgy ; refractory materials ; high pressure gas reactions ; fuel and combustion problems generally ; the design of semi-scale plant, etc.

Special Apparatus and Facilities : General laboratories for both chemical and physical work with special provision for calorimetry and photometry. Rooms are provided for furnaces and high temperature work, and also a laboratory for the study of the application and flow of heat. A separate installation exists for the study of the heating and ventilating efficiency of gas appliances. There is a departmental workshop with skilled mechanics in charge. A departmental library and museum is provided with facilities for reading, writing and drawing. The *Corbett Woodall Laboratory* is specially equipped for experimental work on a large scale. It is provided with a retort and purifying train for carbonisation tests, and two 1,000 cubic feet gas-holders. There are specially appointed laboratories for teaching and research work in refractory materials and in chemical engineering. The *Metallurgical Laboratories* are equipped for the assaying of ores, general metallurgical and spectro-metric analysis. They contain modern apparatus for the metallographic and thermal examination of alloys, for tests of tensile strength, hardness and fatigue. A small rolling mill and a wire drawing mill are provided.

Relations of the Department with Industry : The Department co-operates with the Gas Research Board in research supported by the Board and guided by a Joint Research Committee of the Board and the University. A group of research chemists is working under this scheme on *ad hoc* problems of the gas industry and is at present dealing with the high pressure gasification of coal, some catalytic syntheses complementary thereto and the combustion characteristics of town gas.

A group of research metallurgists is engaged upon an investigation for the Alloy Steels Research Committee of the Iron and Steel Institute into the influence of furnace atmospheres on the scaling of metals.

Arrangements may be made whereby individuals or industrial concerns may use the laboratories of the Department to make their own investigations, if necessary by their own employees.

Application should be made to : The Head of the Department.

DEPARTMENT OF COLOUR CHEMISTRY AND DYEING

(see also Departments of Leather Industries and Textile Industries below).

EXPERIMENTAL DYEING LABORATORY

Special Apparatus and Facilities : Dyebaths suitable for comparative trials, drying stoves, daylight matching lamps, and other appliances. A special exposure chamber in an elevated position provides facilities for making tests of the fastness of colours to light, and a Fadeometer permits the fastness to light to be determined more rapidly.

PRACTICAL DYEHOUSE

Special Apparatus and Facilities : Machinery for dyeing wool, cotton and rayons in their various stages of manufacture. The machines are of modern type, and include : Callebaut and De Blicquy machines for pieces, tops, loose wool and cotton, and cotton cheeses ; a Simplex machine for loose wool and rags ; a Hussong machine for yarn and hosiery ; a steam and air circulating machine for hosiery ; an experimental jigger for cotton and union piece dyeing ; winches for dyeing wool and rayon pieces ; and vats for cotton and rayon yarns ; also a wash wheel for testing the fastness of dyed materials to washing.

COLOUR CHEMISTRY LABORATORIES

Special Apparatus and Facilities : Equipment for the conduct of chemical work upon intermediates and colouring matters.

CLOTHWORKERS' RESEARCH LABORATORY

Special Apparatus and Facilities : Equipment for the conduct of original research in the chemistry of intermediates and synthetic and natural colouring matters, and upon dyeing processes. The laboratory is spacious and well equipped for carrying out scientific and technical investigations in these subjects. Post-graduate and other advanced students are admitted to research work under the direction of the Professor and Lecturers. Graduates of other universities (British or foreign) and other qualified chemists, may also obtain admission as research workers for any period as desired.

Application should be made to : The Head of the Department.

DEPARTMENT OF LEATHER INDUSTRIES

Special Apparatus and Facilities : Equipment for practical work in leather manufacture, including dyeing, and facilities for the study of all methods of chemical analysis, etc. used in tannery control and technical research. The ground floor comprises a machine room equipped with all the most generally used machines, small model lime-yard and tan-yard, an annex fitted with drums and paddles for light leather tanning etc., and a small control laboratory. The first floor comprises a large laboratory for students and two smaller laboratories, whilst on the second floor are drying rooms, museum and stores.

The Procter Research Laboratories, which are devoted to research in the fundamental chemistry and physics of leather manufacture, are open to all qualified persons, irrespective of nationality, who wish to carry out such research.

Relations of the Department with Industry : Persons prosecuting private industrial investigations can be admitted as research students.

The Procter Memorial Fellowship, established by the International Society of Leather Trades Chemists, requires that the Fellow devote the whole of his time to research on a subject pertaining to the leather or allied industries.

Application should be made to : The Head of the Department.

DEPARTMENT OF MINING : Mining Laboratories

Special Apparatus and Facilities : Apparatus and instruments for the investigation of problems at the mines, and for testing the consumption of power and general efficiency of haulage, winding, pumping, ventilating and coal washing plants. Appliances for the detailed study and practical application of methods of ore dressing. (The Physical, Chemical, Geological, Metallurgical and Engineering Laboratories are open to mining students.)

Application should be made to : The Head of the Department.

Relations of the Department with Industry : The Staff of the Department is greatly assisted by the Mining Advisory Committee composed of eminent mining and petroleum engineers, coal owners and scientists. This Committee helps to maintain active contact between the Mining Department and industry. Special facilities are provided for post-graduate research work both in the laboratories of

the Department and in mines and works outside, and every help is afforded to graduates who, on passing into the industry, find themselves confronted with problems which can be advantageously worked out in conjunction with a well-equipped scientific laboratory.

DEPARTMENT OF TEXTILE INDUSTRIES

Special Apparatus and Facilities : General equipment of the Department for research in textile technology, and well-equipped laboratories for research in textile chemistry and textile physics. (See also Department of Colour Chemistry and Dyeing above.)

Application should be made to : The Head of the Department.

Relations of the Department with Industry : There is a scheme of co-operation between the University of Leeds and the Wool Industries Research Association (*q.v.*, *Unofficial Statements*). Details of this scheme are set out in the Prospectus of the Department.

UNIVERSITY COLLEGE, LEICESTER

PHYSICS DEPARTMENT

Nature of Research : Scattering of electrons and positive ions ; x-ray absorption edges ; para- and dia-magnetic susceptibilities.

Apparatus and Facilities : Reasonable facilities available for high-vacuum and electronic work.

Application should be made to : The Professor of Physics.

CHEMISTRY DEPARTMENT

Nature of Research : (Organic) The hydrogen bond as applied to organic chemistry. (Physical) Physico-organic problems.

Application should be made to : The Professor of Chemistry.

UNIVERSITY OF LIVERPOOL

PHYSICS LABORATORY : George Holt Physics Laboratory.

Nature of Research : Fundamental research in experimental nuclear physics.

Special Apparatus and Facilities : Cyclotron, mass spectrograph, β -ray spectrograph, cloud chambers, ionisation chambers and Geiger Müller counters, equipment for the observation of tracks of particles in photographic emulsions.

Application concerning research should be made to : Prof. Sir James Chadwick, M.Sc., Ph.D., Hon.D.Sc., F.R.S.

ORGANIC CHEMISTRY LABORATORY : Department of Organic Chemistry.

Nature of Research : Chemistry and synthesis of natural products and microbiological chemistry.

Special Apparatus and Facilities : Modern equipment for organic chemical work, for microbiological work, and for micro-analytical work.

Application should be made to : Prof. A. Robertson, M.A., Ph.D., B.Sc., F.R.S.

INORGANIC AND PHYSICAL CHEMISTRY LABORATORY : Department of Inorganic and Physical Chemistry.

Nature of Research : Colloid chemistry ; electrochemistry ; chemical kinetics and photochemistry.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. W. C. McC. Lewis, M.A., D.Sc., F.R.S., F.Inst.P.

INDUSTRIAL CHEMISTRY LABORATORY : Department of Industrial Chemistry.

Nature of Research : Fats, fatty oils, detergents, and materials connected with fat industries.

Special Apparatus and Facilities : Fractionation and detailed composition of fats and fatty acids ; hydrogenation and oxidation of fats and similar products.

Application should be made to : Prof. T. P. Hilditch, D.Sc., F.R.S., F.R.I.C.

METALLURGY LABORATORY : Department of Metallurgy.

Nature of Research : Metallographic research, particularly in the field of the alloys of lead, tin, cadmium and bismuth with special reference to agency phenomena.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Dr. S. J. Kennett, B.Sc., Ph.D., Assoc.R.S.M., D.I.C.

CIVIL ENGINEERING LABORATORY : Department of Civil Engineering.

Nature of Research : Civil engineering hydraulics ; road materials and construction structural design.

Application should be made to : Prof. R. G. Batson, M.Eng., A.K.C., M.I.C.E. M.I.Mech.E.

ELECTRICAL ENGINEERING LABORATORY : Laboratories of Applied Electricity.

Nature of Research : Extra high tension investigations.

Special Apparatus and Facilities : One million volt surge generator ; 300 kv. 50 cycle generator ; radio frequency generator, etc.

Application should be made to : Prof. F. J. Teago, D.Sc., M.I.E.E., or Prof. Meek, D.Eng., F.Inst.P., A.M.I.E.E.

MECHANICAL ENGINEERING LABORATORY : Walker and Harrison Hughes Laboratories.

Nature of Research : General investigations into problems of internal combustion engines, steam turbines, etc.

Application should be made to : Prof. R. G. Batson, M.Eng., A.K.C., M.I.C.E., M.I.Mech.E.

BIOCHEMISTRY LABORATORY : Johnston Biochemical Laboratories.

Nature of Research : Studies of vitamins and their mode of action ; detoxication mechanisms, especially of chemotherapeutic substances.

Special Apparatus and Facilities : Emission and adsorption spectra. Facilities for animal experiments.

Application should be made to : Prof. R. A. Morton, Ph.D., D.Sc., F.R.I.C.

Relations with Industry : Suitably qualified persons may enter the laboratories for research at prescribed fees. Special arrangements exist with British Insulated Callenders Cables, Ltd. for E.H.T. work in the Electrical Laboratories.

UNIVERSITY OF LONDON**Bedford College for Women****PHYSICS LABORATORY**

Nature of Research : Molecular physics ; theory of nucleus.

Special Apparatus and Facilities : Special laboratories available.

Application concerning research should be made to : Prof. H. T. Flint, Ph.D., D.Sc., M.Sc.

ORGANIC CHEMISTRY LABORATORY

Nature of Research : Stereochemical ; synthetic drugs ; general.

Special Apparatus and Facilities : Polarimetric and general equipment.

INORGANIC CHEMISTRY LABORATORY

Nature of Research : Geochemistry.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Adsorption and diffusion in high vacua ; magnetochemistry.

Special Apparatus and Facilities : High vacuum apparatus ; magnetic balance. X-ray plant in course of construction.

Application concerning chemical laboratories should be made to : Prof. E. E. Turner, M.A., D.Sc., F.R.I.C., F.R.S.

Birkbeck College**PHYSICS LABORATORY**

Nature of Research : Structural analyses by x-ray and other methods of : proteins, cementive materials. Cosmic rays ; nuclear physics.

Special Apparatus and Facilities : X-ray apparatus, especially for low angle scattering ; Wilson cloud chambers ; Geiger-Muller counters ; β -ray spectrometer.

Application should be made to : Prof. J. D. Bernal.

CHEMISTRY LABORATORIES

Nature of Research : (Organic) Stereochemistry of amino acids and proteins. (Inorganic) Co-ordination compounds. (Physical) Electrochemistry ; photochemistry ; reaction kinetics.

Application should be made to : The Registrar.

Imperial College of Science and Technology, including the Royal College of Science, Royal School of Mines and City and Guilds College**PHYSICS AND OPTICS LABORATORIES**

Director : Sir George P. Thomson, M.A., F.R.S. (See General Note below.)

ORGANIC CHEMISTRY LABORATORIES

Director : Prof. Sir Ian M. Heilbron, D.S.O., D.Sc., Ph.D., LL.D., F.R.I.C., F.R.S. (See General Note below.)

INORGANIC AND PHYSICAL CHEMISTRY LABORATORIES

Director : Prof. H. V. A. Briscoe, D.Sc., A.R.C.S., D.I.C., F.R.I.C. (See General Note below.)

CIVIL ENGINEERING LABORATORIES

Head of the Department : Prof. A. J. S. Pippard, M.B.E., D.Sc., M.I.C.E. (See General Note below.)

MECHANICAL ENGINEERING LABORATORIES

Head of the Department : Prof. O. A. Saunders, M.A., D.Sc.(Eng.), A.M.I.Mech.E., F.Inst.P. (See General Note below.)

ELECTRICAL ENGINEERING LABORATORIES

Head of the Department : Prof. Willis Jackson, D.Sc., D.Phil., M.I.E.E., F.Inst.P. (See General Note below.)

CHEMICAL ENGINEERING AND APPLIED CHEMISTRY LABORATORY

Nature of Research : Work in connection with fuel technology, the chemistry of coal, high pressure gas reactions, gaseous combustion and explosions, technology of liquefaction processes, chemical engineering, electrothermics, and the study of surfaces.

Head of the Department : Prof. Sir Alfred C. G. Egerton, M.A., B.Sc., F.R.I.C., M.I.Chem.E., Sec.R.S. (See General Note below.)

METALLURGY LABORATORY

Head of the Department : Prof. C. W. Dannatt, A.R.S.M., D.I.C., F.R.I.C. (See General Note below.)

MINING LABORATORY

Head of the Department : Prof. J. A. S. Ritson, D.S.O., O.B.E., M.C., B.Sc., M.Inst.M.M. (See General Note below.)

GENERAL NOTE : Candidates desiring to undertake original research must have completed an Associateship course in one of the Departments of the College or an equivalent course of study elsewhere, and must satisfy the College as to their qualifications for this work. The subject of research must be approved by the Head of the Department concerned, and the work must be done under his supervision or under that of a member of his staff.

All applications must be made on the College entry form, which can be obtained from the Registrar, or, in the case of applicants for the City and Guilds College, from the Deputy Registrar of that College.

Relations with Industry : Seven members of the Governing Body of the College are appointed on the nomination of professional societies ; and special committees, with strong industrial representation, advise the Governing body from time to time on various aspects of education in advanced technology. Many members of the staff of the College have had long industrial experience, and the Governing Body encourages any arrangements which enable the staff and students to keep in touch with technical developments in the industrial world. The College undertakes a considerable amount of research work for industrial firms or Government Departments.

King's College

WHEATSTONE PHYSICS LABORATORY

Nature of Research : Biophysics, chiefly in relations to processes in the single cell ; the scattering of alpha and beta radiations by atomic nuclei ; the fundamental electric nature of atmospherics ; a number of theoretical problems.

Special Facilities : In addition to the usual teaching facilities, this Laboratory is open for research in a variety of subjects.

Application should be made to : Prof. J. T. Randall, F.R.S., Head of the Department.

CHEMISTRY LABORATORY

Special Apparatus and Facilities : Facilities for carrying out research work, either independently or under the direction of members of the staff, are afforded in the Department.

Applications should be made to : The Head of the Department.

CIVIL AND MECHANICAL ENGINEERING LABORATORIES (Faculty of Engineering).

Special Apparatus and Facilities : Equipment for the study of : heat engines and applied thermodynamics ; hydraulics and mechanics of fluids ; machines ; strength of materials ; surveying ; structures ; soil mechanics ; cement and reinforced concrete. Facilities exist for research in most of these subjects.

Application should be made to : The Head of the Department.

ELECTRICAL ENGINEERING LABORATORY : William Siemens Laboratory.

Special Apparatus and Facilities : Equipment for study and research in various branches of electrical engineering, particularly in relation to non-linear electric circuit phenomena.

Application should be made to : The Professor of Electrical Engineering.

Royal Holloway College

PHYSICAL LABORATORY

Nature of Research : Interferometry ; studies of surfaces of crystals, metals, plastics. High resolution spectroscopy.

Special Apparatus and Facilities : Interferometers ; spectrographs.

Application concerning research should be made to : Prof. S. Tolansky.

ORGANIC CHEMISTRY LABORATORY

Nature of Research : Carbohydrate chemistry ; mechanism of organic reactions polymerisation.

Application should be made to : Prof. Gwyn Williams.

INORGANIC CHEMISTRY LABORATORY

Nature of Research : Analytical methods.

Application should be made to : Prof. Gwyn Williams.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Adsorption.

Application should be made to : Prof. Gwyn Williams.

University College**PHYSICS LABORATORY**

Nature of Research : Viscosity of liquids ; fundamental mechanical properties of metals, especially of single metal crystals.

Special Apparatus and Facilities : X-ray apparatus for crystal structure.

Application concerning research should be made to : Prof. E. N. da C. Andrade, D.Sc., Ph.D., F.R.S.

ORGANIC CHEMISTRY LABORATORY

Nature of Research : Mechanism of organic reactions ; spectroscopy of isotopically distinguished hydrocarbons.

Special Apparatus and Facilities : Chemical indicators by mass spectrometer or β -ray counter ; spectroscopic equipment ; x-ray crystallograph.

Application should be made to : Prof. C. K. Ingold, D.Sc., F.R.S.

INORGANIC CHEMISTRY LABORATORY

Nature of Research : Separation magnetic properties of the rare earths ; artificial radioactivity.

Special Apparatus and Facilities : Magnetic apparatus ; 300kv neutron source ; supply of separated or concentrated rare earths

Application should be made to : Prof. S. Sugden, D.Sc., F.R.S.

CIVIL ENGINEERING LABORATORY

Nature of Research : Aerial survey and photogrammetry ; soil mechanics ; water pollution and purification ; structures ; engineering materials, including vibrated concrete.

Special Apparatus and Facilities : Water filtration ; vibrated concrete ; constant temperature room ; soil mechanics ; electric strain gauge apparatus.

Application should be made to : Prof. H. J. Collins, M.Sc., M.I.C.E., M.I.Mech.E., P.I.Struct.E.

ELECTRICAL ENGINEERING : Pender Electrical Engineering Laboratory.

Nature of Research : Electrical engineering problems in general, and micro-wave problems in particular.

Special Apparatus and Facilities : Special facilities for investigation of micro-wave phenomena.

Application should be made to : Prof. R. O. Kapp, B.Sc., M.I.E.E.

CHEMICAL ENGINEERING : Ramsay Laboratory of Chemical Engineering.

Nature of Research : Research in the fundamental processes of chemical engineering, such as heat transfer, distillation, filtration and sedimentation and their applications.

Special Apparatus and Facilities : Special facilities for the design, erection and testing of small-scale pilot plant.

Application should be made to : Prof. H. E. Watson, D.Sc., M.I.Chem.E.

UNIVERSITY OF MANCHESTER**PHYSICAL LABORATORIES**

Nature of Research : Cosmic radiation and thermionics.

Special Apparatus and Facilities : Suitable for the above.

Application concerning research should be made to : The Professor of Physics.

THOMAS GRAHAM RESEARCH LABORATORY

Nature of Research : Colloid physics, with particular reference to the electro-chemistry of clays.

Special Apparatus and Facilities : Suitable for the above.

Applications concerning research should be made to : D. C. Henry, M.A., Reader in Colloid Physics.

CRYSTALLOGRAPHY DEMONSTRATION LABORATORY AND RESEARCH ROOMS

Application should be made to : The Professor of Physics.

CHEMICAL LABORATORIES

Special Apparatus and Facilities are available for research in physical, inorganic and organic chemistry. Some 30 laboratories are equipped for investigations on the chemistry of natural products, polymerisation, reaction kinetics, bond strengths, the relationship between fine structure and properties in inorganic and organic substances. Facilities are available for micro-analysis, spectrography, calorimetry, measurements of dipole moments, etc. There are 7 large laboratories for the practical work of undergraduate students.

METALLURGICAL LABORATORIES

Special Apparatus and Facilities : Facilities for high-temperature work on casting temperatures, heat treatments, etc. ; determinations of the physical properties and mechanical tests of metals and alloys ; chemical analysis and fire assays of metals, ores, slags, etc. ; the microscopic examination of metals ; the examination of fuels and of oils.

The electro-metallurgical laboratories include especially complete provision for very high temperature tests, as well as the necessary apparatus for practical instruction in electro-analysis, electro-deposition of metals and the electric furnace and its applications. The equipment for research on the drawing of wire is noteworthy.

A small Departmental Library contains a certain number of the more important metallurgical text-books and journals.

ENGINEERING LABORATORIES : Whitworth Laboratories and Osborne Reynolds Research Laboratory.

Special Apparatus and Facilities : *Thermodynamic Laboratory and Boiler-house* : plant includes two boilers, with reciprocating steam engines, and Zoelly steam turbine ; internal combustion engine plant includes a 50 H.P. Diesel engine, a 70 H.P. semi-Diesel Crossley engine, and a number of single and multi-cylinder motor car and aero engines ; there is also a suction gas plant, air compressor and refrigerator. *Hydraulic Laboratory* : high lift pumps, turbines, a Pelton wheel, a hydraulic flume, etc. *Testing Laboratory* : a 100-ton Wicksteed machine and numerous smaller machines used for determining the strength of materials in tension, compression, torsion, and bending ; separate rooms are provided for cement testing and for work on reinforced concrete. *Workshop* : machine tools.

The *Osborne Reynolds Laboratory* is a large laboratory available for research work.

Application should be made to : The Head of the Department of Engineering.

ELECTRICAL ENGINEERING LABORATORIES : John Hopkinson Laboratories.

Special Apparatus and Facilities : Equipment for providing full instruction in the testing of electrical engineering materials and the more important types of electrical machinery and apparatus. The Laboratories are fitted up with representative types of modern alternating-current plant, and special provisions have been made for instruction in thermionic, high frequency, high vacuum, high voltage and instrument standardising work.

Special facilities are afforded in the Laboratories for post-graduate research work leading to the M.Sc. and Ph.D. degrees.

Application should be made to : The Head of the Department.

UNIVERSITY COLLEGE, NOTTINGHAM**PHYSICS LABORATORY**

Nature of Research : Researches in magnetic properties of matter and general properties of matter, mathematical electricity, etc.

Special Apparatus and Facilities : For magnetic investigation of many kinds, metrology, general physics and electronics.

Application should be made to : Prof. L. F. Bates, Ph.D., D.Sc., F.Inst.P., Lancashire-Spencer Professor of Physics.

ORGANIC CHEMISTRY LABORATORY

Nature of Research : General organic research ; chemotherapy ; research on polynucleotides and nucleoproteins.

Special Apparatus and Facilities : All normal and some specialised facilities for particular researches.

INORGANIC CHEMISTRY LABORATORY

Nature of Research : General inorganic research.

Special Apparatus and Facilities : All normal facilities.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Researches on macromolecular and surface chemistry, colloids and electrochemistry.

Special Apparatus and Facilities : All normal facilities, special apparatus for colloid chemistry and surface chemistry.

Application should be made to : Prof. J. M. Gulland, M.A., D.Sc., Ph.D., F.R.I.C., F.R.S., Sir Jesse Boot Professor of Chemistry.

ELECTRICAL ENGINEERING LABORATORY

Nature of Research : General problems of electromagnetic machinery ; radio engineering ; characteristics and applications of electric discharge lamps.

Special Apparatus and Facilities : Normal facilities in Machinery, Measurements and Radio Engineering Laboratories. Special laboratory for illuminating engineering.

Application should be made to : Prof. H. Cotton, M.B.E., D.Sc., M.I.E.E.

CIVIL AND MECHANICAL ENGINEERING LABORATORY

Nature of Research : Reinforced concrete ; vibrations.

Special Apparatus and Facilities : Full facilities for all ordinary tests on materials ; tensile, compression and bending ; hardness, brittleness and fatigue tests on metals ; microscopic examination ; tests on cement, concrete, sand and aggregate.

Application should be made to : Prof. C. H. Bulleid, O.B.E., M.A., Assoc.M.Inst.C.E., M.I.Mech.E.

MINING AND FUELS LABORATORY

Nature of Research : Ventilation problems ; coal and coal dust problems ; combustion of fuel in open hearth fires.

Application should be made to : J. M. R. Watson, B.Sc.Eng., M.I.Min.E., M.I.M.S.

PHARMACY LABORATORY

Nature of Research : General pharmaceutical research, including the quantitative microscopy of drugs.

Special Apparatus and Facilities : All normal facilities, including growing medicinal plants.

Application should be made to : G. E. Trease, B.Pharm., Ph.C., F.R.I.C., F.L.S.

TEXTILE LABORATORIES

Special Apparatus and Facilities : The Laboratories include a main Hosiery Laboratory, a Textile Research Laboratory, a Dyeing and Finishing Laboratory, a Practical Dyeing Laboratory, a Practical Finishing Laboratory, a Spinning Laboratory, a Weaving Laboratory, a Photo-Micrographic Laboratory, and a temperature and humidity automatic control chamber.

The Department is thoroughly equipped with a complete range of apparatus and modern machinery for demonstrating the technicalities of spinning, textile testing, hosiery manufacture, making-up and trimming, weaving, dyeing and finishing, and for experimental work and research. The research apparatus comprises : projecting microscope and polariser for fibres ; autographic single thread machine, autographic twist testing machine ; Shorter and Hall single thread autographic testing machine ; ballistic strength testing machine ; photo-micrographic apparatus ; extension testing machine ; Moscrop yarn tester ; Goodbrand cloth tester ; balance single thread twist machine ; tension tester ; testing machine for measuring fabric thickness (Marsh) ; Fadeometer for testing colour fastness ; bursting tester ; ultra-violet cabinet ; abrasion testing machines.

The Departmental Library contains a comprehensive collection of books and periodicals in all branches of the textile industry.

Relations of the University with Industry : Certain Departments of the College undertake a considerable amount of industrial research and analytical investigations. Manufacturers who wish to obtain confidential scientific advice in connection with industrial operations are invited to communicate with the Registrar. The fees charged for such work vary according to the nature of the research or investigation to be undertaken.

UNIVERSITY OF OXFORD

PHYSICS DEPARTMENT : Clarendon and Electrical Laboratories.

Nature of Research : Low temperature, nuclear physics, electrical, meteorological and spectroscopic research.

Special Apparatus and Facilities : Liquid hydrogen and liquid helium ; high voltage apparatus.

Application should be made to : Prof. the Right Hon. Lord Cherwell, The Clarendon Laboratory, Parks Road, Oxford.

ORGANIC CHEMISTRY LABORATORY : Dyson Perrins Laboratory, Oxford.

Application should be made to : Professor Sir Robert Robinson, F.R.S.

INORGANIC CHEMISTRY LABORATORY

Nature of Research : General inorganic chemistry.

Special Apparatus and Facilities : General.

Application should be made to : Dr. Lee's Professor of Chemistry.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : General physical chemistry.

Special Apparatus and Facilities : General.

Application should be made to : Dr. Lee's Professor of Chemistry.

METALLURGY SECTION (INORGANIC CHEMISTRY LABORATORY)

Nature of Research : Chemical aspects of metallurgy.

Application should be made to : Lecturer in Metallurgy.

CHEMICAL CRYSTALLOGRAPHY (INORGANIC CHEMISTRY LABORATORY, DEPARTMENT OF CHEMICAL CRYSTALLOGRAPHY)

Nature of Research : Chiefly x-ray structural analysis.

Application should be made to : Reader in Chemical Crystallography.

ENGINEERING LABORATORY

Nature of Research : A small amount of research is carried out, mostly of a fundamental nature, into various aspects of engineering sciences.

Special Apparatus and Facilities : Facilities are afforded in the Engineering Laboratory to advanced students and to graduates (or, in special cases, to an undergraduate who has passed the Final Examination at the end of his second year) for undertaking research work. To obviate delay in the provision of special apparatus and equipment, it is desirable that an intending research student should communicate with the Professor at the earliest possible moment, indicating (so far as it is known) the line of investigation which he desires to prosecute.

Application should be made to : The Professor of Engineering Science, Engineering Laboratory, Parks Road, Oxford. Approach should be made through the applicant's intended college.

UNIVERSITY OF READING

PHYSICS LABORATORY

Nature of Research : Electron-diffraction, spectroscopy (vacuum), semi-conductors.

Application concerning research should be made to : Prof. Ditchburn.

ORGANIC CHEMISTRY LABORATORY

Nature of Research : Walden inversion.

Application concerning research should be made to : Prof. E. A. Guggenheim, M.A., Sc.D., F.R.S.

INORGANIC CHEMISTRY LABORATORY

Application concerning research should be made to : Prof. E. A. Guggenheim, M.A., Sc.D., F.R.S.

PHYSICAL CHEMISTRY LABORATORY

Nature of Research : Thermodynamics, theoretical and applied.

Application should be made to : Prof. E. A. Guggenheim, M.A., Sc.D., F.R.S.

UNIVERSITY OF ST. ANDREWS

(United College, St. Andrews and University College, Dundee).

PHYSICS LABORATORIES : Department of Natural Philosophy, United College, St. Andrews.

Nature of Research : Original work on the solid state, including x-ray crystallography. Stereoscropy and stereoscopic vision.

PHYSICS LABORATORIES : University College, Dundee.

Special Apparatus and Facilities : There is accommodation in the Physics Department for post-graduate students who wish to carry out research work.

CHEMISTRY LABORATORIES : Department of Chemistry, United College, St. Andrews.

Nature of Research : Chemistry of sugars and the more complex carbohydrates ; stereochemical problems ; chemistry of menthols, menthones, piperitols, phellandrenes, carvone and similar substances derived either directly or indirectly from essential oils of plants ; alkaloids. Synthetic work is also being prosecuted in other fields of organic chemistry.

Special Apparatus and Facilities : The Research Institute includes one large and several small research laboratories, a private research laboratory, a well-equipped chemical library, and special rooms for polarimetry, etc. As at present organised, there are places for about 16 research workers, apart from members of the staff. Normally the accommodation of the research laboratories is fully taken up, so that applications for admission should be made at least three months before it is desired to begin work.

CHEMISTRY LABORATORIES : University College, Dundee.

Nature of Research : Mainly in the fields of electro-chemistry, the theory of solutions and the rates of mechanisms of chemical reactions. Study of electrode processes, corrosion in oils, the ionisation of acids and bases, the vapour pressures of mixtures and the use of isotopes in examining chemical reactions.

Special Apparatus and Facilities : A laboratory is specially equipped for electro-chemistry, including electro-deposition and electro-analysis. Excellent facilities are available for precise measurements of vapour pressure, the electromotive force of cells, electrical conductivity of solutions, and also for high vacuum work. Separate rooms are equipped for polarimetry, refractometry and spectroscopy.

ENGINEERING LABORATORIES : University College, Dundee.

Special Apparatus and Facilities : The laboratories are well fitted for research work in general engineering, in strength of materials, in hydraulics, and in internal combustion engineering.

ELECTRICAL ENGINEERING LABORATORY : Peters Electrical Laboratory.

Special Apparatus and Facilities : The equipment comprises a comprehensive range of standard instruments, resistances, inductances, condensers, etc.

UNIVERSITY OF SHEFFIELD

PHYSICS LABORATORY : Department of Physics.

Nature of Research : Magnetism and ferromagnetic properties with special reference to atomic structure of alloys ; infra-red spectroscopy and molecular structure ; ultrasonic phenomena.

Special Apparatus and Facilities : Equipment for ferromagnetic measurements and infra-red spectroscopy, supersonics, x-ray structure.

Application concerning research should be made to : Prof. W. Sucksmith, F.R.S.

ORGANIC CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : General organic chemistry.

Application should be made to : Prof. R. D. Haworth, F.R.S.

INORGANIC CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : General investigations in analytical problems.

Application should be made to : Prof. R. D. Haworth, F.R.S.

PHYSICAL CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : General physical chemistry.

Application should be made to : Prof. R. D. Haworth, F.R.S.

METALLURGY LABORATORY : Department of Metallurgy.

Nature of Research : Hydrogen in steels, and its effect on the incidence of "hair-line" cracking; the effect of hydrogen on the mechanical properties of steels; viscosity of welding-rod coatings; the properties and fundamental characteristics of metal powders (ferrous and non-ferrous); the physical chemistry of slag-metal reactions; the effect of cold-work on the physical properties of steel (magnetic and α -ray); the quench-ageing of alloy steels; isothermal transformation work on coarse and fine-grained steels; steel casting-properties and method of casting; the fragmentation of shell and metal tubes (Ministry of Supply with Departmental staff); research on mine haulage gear for Safety in Mines Research Board; research and inspection of materials for Armaments Research Board (Ministry of Supply); the constitution of annealed, quenched and cold-worked alloy steels; the electrical resistivity and other physical properties of carbon and alloy steels in the strained and unstrained state; the physical changes occurring during the working of alloy steels; cold-rolling research (British Iron and Steel Research Association).

Special Apparatus : Electron-diffraction plant; α -ray plant (continuously evacuated); large precision Hilger quartz spectrograph; cold-rolling mill (production scale), fitted with recording apparatus for measuring roll pressures, torque, front and back tension and strip thickness (now used by British Iron and Steel Research Association); wire drawing bench; Imperial Chemical Industries, Ltd. ammonia cracking plant; vacuum heating apparatus (in quantity); vacuum fusion apparatus for determination of oxygen and other gases in steel; alcoholic iodine solution apparatus; vacuum dilatometric apparatus; photomicrographic apparatus (Reichert, large and small); tensometer equipment (tensile, Izod and extensometer); fifty-ton tensile testing machine (Denison); fifty-ton tensile testing machine (Avery) BISRA; micro-hardness (diamond) testing apparatus; half-ton Greaves Etchells electric arc steel melting furnace; half-ton rotary Bracklesburg furnace; cupola (25 cwts/hour); oil and coke-fired crucible furnaces (60 lb. capacity); 35 KVA coreless induction furnace (spark gap); large scale gas and electric heat-treatment plant with accessories; refractories department fully equipped for sand testing and high temperature constitution work; six Cambridge temperature regulators; Cambridge DC amplifiers, and other forms of temperature regulators.

Facilities : Large general Analytical Laboratory capable of accommodating 200 students; three Research Laboratories; Metallography Laboratory; Photomicrographic and Physical Testing Laboratory; Mechanical Testing Laboratory; two Dark Rooms (one thermostatically controlled); one Print Room; Assaying Laboratory; Foundry and Heat-Treatment Shop; Machine Shop; three individual Research Rooms.

Application should be made to : Prof. J. H. Andrew, D.Sc., M.Inst.Met., F.Inst. Metallurgists, Member of Council, Iron and Steel Institute, at the Department of Metallurgy, Applied Science Department, St. George's, Sheffield, 1.

Relations of the Department with Industry : The Department is represented by the Professor or a member of staff on many of the Research Committees of the Iron and Steel Institute and the British Iron and Steel Research Association.

The liaison between local industry and the University is made by personal contact. A member of staff is Chairman of a Discussion Group on Spectrographic Analysis, the other members of which are representatives of the works using the method. Collaborative research, particularly in the determination of oxygen, has been going on for the last ten years. A member of staff is the Chairman of the Chemists' Panel of the appropriate Committee of the Institute. If any problem arises that cannot be dealt with in the Department, or that is better dealt with on an industrial scale, the local industries co-operate in allowing facilities for the work. The Department assists any industry that asks its advice.

CIVIL ENGINEERING LABORATORY : Department of Civil Engineering.

Nature of Research : Soil mechanics; the settlement and ultimate bearing capacity of foundations on clay and sand.

Special Apparatus and Facilities : Consolidation and shear testing apparatus.

Application should be made to : N. S. Boulton, M.Sc., A.M.Inst.C.E.

ELECTRICAL ENGINEERING LABORATORY : Department of Electrical Engineering.

Nature of Research : Magnetic methods applied to the non-destructive testing of materials.

Application should be made to : Dr. T. F. Wall, D.Sc., D.Eng., M.I.E.E., A.M.Inst.C.E.

MECHANICAL LABORATORY : Department of Mechanical Engineering.

Nature of Research : Deep-drawing of sheet metal ; bearing lubrication.

Special Apparatus and Facilities : Experimental presses and testing equipment ; specially designed apparatus for journal bearing research.

Application should be made to : Prof. H. W. Swift, M.A., D.Sc.(Eng.), M.I.Mech.E.

MINING LABORATORY : Department of Mining.

Nature of Research : Research on safety and production problems in the mining industry with special reference to ventilation, the safe use of electricity, lighting, subsidence, etc.

Special Apparatus and Facilities : Well-equipped laboratories with special apparatus and facilities for research into mining problems.

Application should be made to : Prof. I. C. F. Statham, M.Eng., M.I.Min.E., F.G.S.

FUEL TECHNOLOGY LABORATORIES : Department of Fuel Technology.

Nature of Research : Properties and constitution of coal ; combustion of coal and other fuels ; analytical methods of fuel analysis, particularly semi-micro methods ; micro-analysis of gases ; pyrolysis of hydrocarbons ; hydrogenation of coconut shell tar ; fundamental aspects of coke formation ; reactions of oxygen and other gases in fuel processes and utilisation ; heat evolution and variable flow of heat in furnace technology ; survey of characteristics of plant in fuel utilisation ; furnace design and practice.

Special Apparatus and Facilities : Apparatus for determining constitution of coal by thermal decomposition ; for the photographic study of gaseous combustion ; for semi-micro methods of analysis of all types of fuel ; for vacuum distillation ; for hydrocarbon synthesis at medium pressures ; for studies of the formation and properties of carbonised fuels and of high temperature gaseous reactions.

A broad programme is envisaged for the development of other special apparatus connected with the above researches, and the widening of investigations into the preparation and utilisation of fuels in all aspects.

Application should be made to : Prof. R. J. Sarjant, O.B.E., D.Sc., F.Inst.F., F.I.M.

GLASS TECHNOLOGY LABORATORY : Department of Glass Technology.

Nature of Research : All subjects related to glasses ; their properties, manufacture, after-treatment and uses, including the study of raw materials, furnaces and machinery.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. H. Moore, D.Sc., A.R.C.S., F.Inst.P., F.S.G.T. N.B. For Glass Delegacy see section *Unofficial Statements*.

Relations with Industry : Several of the Departments maintain close contact with particular branches of industry through the recognised institutions and research associations, e.g. the Department of Mechanical Engineering through the Institution of Mechanical Engineers and the Automobile Research Department of the Institution of Automobile Engineers ; the Department of Fuel Technology with the local iron and steel industry through the British Iron and Steel Federation. The Mining Department maintains intimate contact with the local mining industry which grants facilities for research, and there is also a Mining Research Advisory Committee which includes representatives of the mining industry.

UNIVERSITY COLLEGE, SOUTHAMPTON

PHYSICS LABORATORY : Physics Department.

Nature of Research : Optical, thermal and electrical properties of metallic films, and of metals in the neighbourhood of their melting point ; optical problems of artificial double refraction ; high frequency phenomena in valve circuits ; molecular spectroscopy.

Applications concerning research should be made to : Prof. A. M. Taylor, M.A., Ph.D., F.Inst.P.

AERONAUTICAL ENGINEERING LABORATORY

Nature of Research : Various investigations involving the use of the wind tunnel.
Application should be made to : Prof. T. R. Cave-Browne-Cave.

CIVIL ENGINEERING LABORATORY

Nature of Research : The use of electric strain gauges to determine stress distribution in steel structures.

Application should be made to : Prof. T. R. Cave-Browne-Cave.

MECHANICAL ENGINEERING LABORATORY

Nature of Research : The reduction of noise with special reference to silencers for engines and compressors, including those used in aircraft ; heat transfer with special reference to the condensation of steam.

Application should be made to : Prof. T. R. Cave-Browne-Cave.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH**PHYSICS LABORATORY** : Department of Physics.

Nature of Research : Experimental work on mesotrons and cosmic rays and on stress and plastic waves.

Special Apparatus and Facilities : High pressure cloud chamber ; very large chamber for atmospheric pressure. Well equipped for elasticity and r.f. measurements.

Application concerning research should be made to : The Professor of Physics.

ORGANIC CHEMISTRY LABORATORY : Edward Davies Chemical Laboratories.

Nature of Research : Biochemistry ; nitroparaffins.

Special Apparatus and Facilities : Apparatus for biochemical research, in conjunction with the Agricultural Departments.

Application should be made to : The Professor of Chemistry.

INORGANIC CHEMISTRY LABORATORY : As above.

Nature of Research : Silica-hydrofluoric acid equilibria ; analysis of trace elements.

Application should be made to : The Professor of Chemistry.

PHYSICAL CHEMISTRY LABORATORY : As above.

Nature of Research : Conductivity ; polarography ; exchange resins.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR**PHYSICS LABORATORY** : Department of Physics.

Nature of Research : Crystal structure of metals and alloys as revealed by x-rays ; accurate measurement of specific heats and electrical resistances ; problems in radiology.

Application should be made to : Prof. E. A. Owen, M.A., Sc.D., M.Sc., D.Sc., F.Inst.P.

ORGANIC CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : A study of the mechanism of organic reactions and its application to theoretical and industrial problems.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. E. D. Hughes, Ph.D., D.Sc., F.R.I.C.

PHYSICAL CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : Investigations concerning the kinetics of reactions and molecular structure.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : Prof. E. D. Hughes, Ph.D., D.Sc., F.R.I.C.

ELECTRICAL ENGINEERING LABORATORY : Department of Electrical Engineering.

Nature of Research : Magnetic properties at high flux densities.

Application should be made to : Prof. W. E. Williams, B.Sc.

UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE CARDIFF

PHYSICS, CHEMISTRY AND METALLURGICAL LABORATORIES

ENGINEERING LABORATORIES

Special Apparatus and Facilities : Equipment for work on civil engineering, mechanical engineering, electrical engineering, and building. The buildings of the Engineering Department comprise Drawing Offices, Library, Testing House, Mechanical and Electric Laboratory, Workshop, Cement Laboratory, etc.

MINING LABORATORIES

Special Apparatus and Facilities : Laboratories for the study of air analysis, rescue and first-aid, preparation of minerals for the market, ventilation, illumination, photometry, gas testing, etc. Various good modern instruments for surveying are available. The Departmental Library is very well equipped, and all books in it are available for the use of present and past students of the Department.

The Research Laboratory of the Monmouthshire and South Wales Coal Owners' Association is housed in the Department.

UNIVERSITY COLLEGE OF SWANSEA (A constituent College of the University of Wales)

PHYSICS LABORATORY : Department of Physics.

Nature of Research : Experimental physics ; ionisation physics ; collisional processes in gases ; the electric spark ; radio propagation in ionosphere ; spectroscopy. Theoretical physics : problems including the wave mechanics of optical spectra.

Special Apparatus and Facilities : Suitable for the above.

Application concerning research should be made to : Prof. F. Llewellyn Jones, D.Phil., M.A.

CHEMISTRY LABORATORY : Department of Chemistry.

Nature of Research : (Organic chemistry) Studies on : hydrogen cyanide ; dihydro resorcinals ; the Friedel-Crafts reaction. (Physical chemistry) Physico-chemical and electro-chemical studies on hydrogen cyanide ; the kinetics of polymorphic transformation of crystals.

Application should be made to : Prof. J. E. Coates, D.Sc.

ENGINEERING LABORATORY : Department of Engineering.

CIVIL ENGINEERING.

Nature of Research : Active and passive pressures in cohesive soils ; stability of footings and of T-shaped walls.

Special Apparatus and Facilities : Pressure gauges, etc. for measurement of earth pressures ; tests in the open at sand pits on sea-shore and College grounds.

MECHANICAL ENGINEERING.

Nature of Research : Steam jet air induction in boiler furnaces ; vibration problems ; rolling-mill problems.

Special Apparatus and Facilities : Steam and air metering instruments ; automatically controlled gas fired boiler.

ELECTRICAL ENGINEERING.

Nature of Research : Electronics direction-finders and aerial systems, high-frequency and micro-wave measurements.

Application should be made to : The Professor of Engineering.

METALLURGICAL LABORATORY : Department of Metallurgy.

Nature of Research : All matters relating to the constitution of physical properties of non-ferrous and ferrous metals and alloys.

Special Apparatus and Facilities : Suitable for the above.

Application should be made to : The Professor of Metallurgy.

Relations with Industry : To ensure the closest possible co-operation with the local industries, Advisory Committees in Metallurgy and Engineering have been set up.

The manufacturers of the district, who contribute largely to the support of the College, give the staff and students ample opportunities of keeping in close practical touch with manufacturing processes in the works.

Industrial Research in Technical Colleges

Report by a Special Sub-Committee of the Industrial Research Committee

*Adopted by the F.B.I. Industrial Research Committee
at its meeting on October 23, 1946.*

I. Terms of Reference.

"To consider the results of a survey on the Industrial Research activities of Britain's Technical Colleges and the Ministry of Education's future plans for Industrial Research in Technical Colleges; to report on the possibility of co-operation by industry and the form such co-operation might take."

In the autumn of 1945 the F.B.I. Industrial Research Secretariat and the Ministry of Education jointly carried out a survey covering some 57 of the senior Technical Colleges, not including the Imperial College of Science and Technology. We have enjoyed the opportunity of focusing our attention directly on this subject, and of holding confidential discussions with representatives of the Ministry. More recently the views of the Ministry of Education on this subject have been set out in an official Circular No. 94, dated 8th April, 1946 (see Appendix (1), page 329).

2. Consideration of Present Position as shown in Survey.

The Survey and its results.

The Technical Colleges examined could be divided broadly into three categories:

- (i) Those not carrying out research.
- (ii) Those carrying out some research.
- (iii) Those carrying out an appreciable amount of research.

No hard and fast line could be drawn between categories (ii) and (iii).

The questions asked in the survey fell into three sub-groups—*General*, *Specifically on Research*, and *Links with Industry*. We understand that in each case the Questionnaire was completed by H.M. Inspector of the Ministry of Education, after consultation with the Principal of the Technical College concerned. There are about 200 Technical Colleges in the country, of which 57 were selected by the officials of the Ministry as being most likely to be in a position to provide positive answers. Some of the colleges, while not of major general importance, were included for their relation to specific industries.

CATEGORY (i)—*Those not carrying out research.*

Among the 57 questioned, there were 13 colleges in this category. Only two of these plan to start research, although several others express interest in the subject and claim to be able to help industry if an

opportunity is offered. Several have close links with leading local firms. Only about three or four of these colleges possess special equipment and under half possess satisfactory libraries.

CATEGORY (ii)—Those carrying out some research.

The 29 in this category comprise the majority of Britain's senior Technical Colleges.

The research effort is for the most part limited to work carried out by individual teachers, in some cases it is post-graduate for higher degrees. In all about 72 individuals are carrying out research, of whom some 52 are members of the staffs of Technical Colleges. The research work carried out is naturally very diversified, and in some cases has obvious industrial implications being carried out extra-murally at the instigation of a research association or individual concern. In some of the others it is of a highly specialised nature, presumably because the research worker has an interest in that direction or because local industry has requested, encouraged, or sponsored the investigation in question. Liaison with industry varies very greatly from a fair degree of intimacy to limited and casual contact. Most of these colleges are keen to initiate an organised programme of research work.

CATEGORY (iii)—Those carrying out an appreciable amount of research.

There are 15 Technical Colleges in this category, including the most important and best known Technical Colleges, where more than five persons are carrying out research. About ten of these colleges possess special equipment of value for industrial purposes, and all have close links with industry; all but two possess satisfactory libraries. Of the 250 (approx.) research workers reported in the returns, about 160 are staff and the remainder students or graduates. In many of these colleges staff, graduates and students are all engaged on research. The research programmes are quite wide and for the most part appear to be carried out in collaboration with local industry. Over half of these colleges are planning considerable expansion to their research activities and facilities. Some extra-mural work is being carried out in two or three cases in conjunction with Research Associations. According to these returns in several colleges the amount of research work was appreciably greater in several Technical Colleges in 1939 than it was in the autumn of 1945; due presumably to the effect of war conditions.

The over-all picture in these colleges is one of progressive development, handicapped by inadequate facilities, equipment, and lack of staff.

3. General Points from Survey.

(a) Research Scholarships.

In only seven colleges do these exist. In several, however, grants from D.S.I.R. and other bodies are being made to individual research workers, and in one or two cases endowments have been given by industry.

(b) Fundamental Research.

Fundamental Research is carried out in a number of instances by individual teachers and students for higher degrees.

(c) *Consultant Work.*

Where close contact exists with local industry it is normally through heads of departments of the college, who act from time to time in a consultant capacity to industry.

(d) *Testing.*

There are many instances of Technical Colleges (including those which do no research) carrying out testing for local industry, and often specialised equipment exists for this purpose. In a number of cases by arrangement with the Metrology Department of the N.P.L. the Technical College has become the Gauge Testing centre for the engineering industry of a particular area.

(e) *Development Work.*

Development work in assisting in the application of the results of research was limited ; most of it being in connection with special war time requirements of local firms.

(f) *Contacts with Research Associations and D.S.I.R. generally.*

Limited and very spasmodic.

4. Comments.

We set out our views on various aspects of the subject in the belief that there is room for discussion as to the increasing part the Technical Colleges can play within the framework of the present organisation of industrial research in this country, and in the hope that these views will find wide circulation, and acceptance.

(i) *General.*

The survey has revealed that the amount of research carried out by British Technical Colleges, and the extent to which Technical Colleges are proving of assistance to industry, especially local industry, in the field of research, development, and advice are inadequate when measured either in terms of the resources and potentialities of Technical Colleges on the one hand or the requirements of industry on the other. We are of the opinion, furthermore, that industry is not and has not been made sufficiently aware of the facilities that exist in Technical Colleges or of the assistance they can provide in the solution of industrial problems, and in the application of scientific knowledge for the benefit of local industry. We recognise that the main function of Technical Colleges is the advancement and dissemination of knowledge, especially knowledge of value to industry, and those engaged in industry, and that any research carried out must bear some relation to this function.

The Colleges whose activities and facilities are most likely to be of interest to industry are set out in an Appendix at the conclusion of this report. (These details, which are not necessarily comprehensive, were supplied by the Colleges, and have been brought up to date, as at 1st January, 1947 ; see Appendix (2), page 333).

(ii) *Particular.*

(a) *Scope of Industrial Research in Technical Colleges.*

It is becoming increasingly recognised today that the imparting

of knowledge cannot be separated from its advancement, if teachers are to maintain their enthusiasm, and the right type is to be attracted to the teaching profession. Scope for research by teachers should therefore be a *sine qua non* in all senior Technical Colleges, and opportunity should at the same time be provided for students and graduates interested to participate in carrying out original investigations related to local needs and interests.

The primary responsibility of the Technical College is to teach and train men for technical positions in industry, and any research carried out, whether by the teacher or advanced students, should always therefore bear some relation to this objective, bearing in mind that training men for research positions in industry is not necessarily outside the function of the Technical College, although by far the greater number of research staff will still presumably be recruited from the universities. Nevertheless, with the considerable unsatisfied demands by industrial research laboratories for qualified workers, the Technical College can play a useful part in supplying research technologists for industry, especially the engineering sections of industry. Furthermore, it is often of value to members of the Technical College staff to carry out industrial investigations, as it may assist them to keep up to date in their knowledge of industrial practice and thus relate their teaching more closely to industrial needs. So far as industry is concerned, however, the Technical College as a rule cannot be of more than auxiliary value for the solution of problems and general advancement, although in several instances work of considerable value in the war effort was carried out by Technical Colleges. So far as long range fundamental research is concerned, we believe it to be true that such research is normally best carried out at a university or independent institution, or by an industrial research association; but in appropriate cases investigations of long range fundamental research problems of interest to industry may well be suitable for Technical Colleges adequately equipped and staffed to carry out such work.

(b) *Research for local industry.*

A number of Technical Colleges are capable of pursuing development research for local industry in solving the problems involved in the technical application of the results of fundamental research. Investigations where the manufacturing concern offers to pay full costs, with a proviso that publication should be prohibited or seriously restricted should be considered in the light of the test we have proposed in paragraph (a) above; otherwise our views coincide with those expressed in the recent Ministry of Education Circular paragraph 5 (iii) (see page 330).

“(iii) Probably the most important and suitable type of research for teachers in Technical Colleges is applied research undertaken at the direct or indirect suggestion of industry and commerce. Here the value of the work is two-fold: first, it brings the college and teaching staff into close contact with industry and commerce to the general benefit of students and teachers

alike, and secondly, it establishes direct relations between industry and commerce and the advanced work of the college.

This type of investigation, being mainly of a developmental character, will be of particular service to local industry, and especially smaller firms. Where the Technical College possesses special apparatus or equipment not otherwise available, its use should be at the service of industry, particularly local industry.

The results of research should be published as soon as possible after completion, subject, where appropriate, to an agreed delay to allow the firm paying for the work to have priority in their application, and subject also, where necessary, to consideration of Patent possibilities. Where fees are to be paid from outside sources, an equitable arrangement should be agreed upon beforehand as to the allocation to be made between the teacher concerned and the college authorities."

(c) *Consultation with local industry.*

In fields in which the Technical College specialises, or is active, consultation should be as wide as industry desires. This is not to suggest that staff of the Technical College should replace or even compete with the private consultants. Each has his particular sphere of activity and service to industry. In the final issue, which is an individual one, the test must be: "What contribution can be brought to the solution of the problem, and what can be learned from it for teaching and training?"

We would refer to the recent publication of *Principles suggested for a Code of Practice in respect of consulting and similar work accepted by members of whole-time academic staffs*, which has been approved by the Board of the Institute of Physics and the Council of the Royal Institute of Chemistry. We believe the general principles laid down to be sound, always bearing in mind, however, that they are intended primarily to cover physicists and chemists rather than engineers and technologists, and the main responsibility of the academic staff which is to teach and train their students, must first be adequately discharged.

(d) *Testing for local industry.*

We subscribe to the view expressed in paragraph 5 of the Ministry Circular, as follows: "In some colleges it has been the practice to carry out a certain amount of routine testing on behalf of local industry. This should only be done when industrial facilities are not available. Where, however, the Technical College possesses special apparatus or equipment not otherwise available, its use should be at the service of industry."

(e) *Information.*

We feel strongly that it is the responsibility of the Technical Colleges themselves to obtain and make full use of all industrial,

technical, and scientific sources of information, and they should take active steps to maintain contact with industry, and particularly their local industries, and so keep themselves up to date with current industrial technique and needs.

(f) *Contacts with Research Associations.*

In all cases and especially in the case of Monotechnics and National Colleges, liaison with the appropriate Research Association or Associations is highly desirable. From time to time research associations may find certain Technical Colleges suitable for carrying out extra-mural work and might welcome junior teachers from Technical Colleges as trainees on their own staff with a view to extending their knowledge of the subject. Furthermore, today, with the increase in size and importance of research associations, they have become one of the main channels for information as to the progressive development of the industry they cover.

(g) *Endowments.*

It is primarily the responsibility of the Local Educational Authority to finance Technical Colleges. It has been found in the past that endowments and grants by industry and others sometimes resulted in the L.E.A. reducing its grants correspondingly, thus defeating their object and discouraging industrial interest. Nevertheless, it is essential that Technical Colleges be adequately equipped, and so long as the L.E.A. and Ministry of Education provide adequate financial support then extra research scholarships and endowments from industry as well as grants for and loans of special equipment and plant should be encouraged, as the more effective the collaboration between Technical Colleges and the industries they are designed to serve, the more fully will the colleges achieve their purpose.

5. Future Plans.

We believe the plans set out in the Ministry's Circular No. 94 lay a sound foundation, and we trust the circular will have the desired effect of placing the position in proper perspective before both Principals and the L.E.A.s. It must be remembered that in each college before anything practical can result, initiative is required to be taken by the Principal in formulating policy and plans and in securing the collaboration of the L.E.A. in their fulfilment.

So far as expansion of effort by individual colleges is concerned, survey records show that most of the colleges have such plans in hand. The report of the Percy Committee on Technological Education, and the Barlow Report on Scientific Manpower, each stress the importance of research, not only for its own sake, but for raising the standard and level of the college teaching and tradition. We well know in each case where a research school has been, or is to be, inaugurated, that its success primarily depends on the one person who directs it and constitutes the focal point. That person is normally the Principal or a Head of a Department, but may be a member of the teaching

staff. Success will be largely dependent on the extent to which he can gain the confidence of local industrialists. We are glad to see that the Ministry now recognise that time spent on research work related to teaching can be included by the teacher within the minimum number of hours he has to devote to teaching. If research in technical colleges is to be effectively encouraged teachers must be allowed adequate time to carry it out. Even with this concession it is doubtful if much headway will be made until the number of teachers is augmented. The number of students per teacher and administration work involved result in the overloading of the individual teacher to an extent that at present often precludes the possibility of research work.

6. The Part Industry can Play.

We feel that there is a positive part that industry can play in the success of the research work at Technical Colleges, which in turn will redound to industry's own benefit. Industry should take increasing interest in the Technical College, not only as a place where staff can be trained, but as a centre which may be of supplementary assistance to the research activities of the industry and the private consultant in the solution of both general and particular industrial problems. We have already indicated in a general way the type of problem suitable for reference to a Technical College (paragraph 4 (ii) a). From a wider angle industrialists can play an increasing part in the work of Regional Councils for further education and on governing bodies of colleges in the capacity of advisers, and thus enhance the value of Technical Colleges to industry and the community.

The income tax position regarding gifts of money and gifts or loans of equipment made by a manufacturing concern to a Technical College for research is explained in the Ministry of Education Circular No. 108 (published on 20th May, 1946). The cost of such gifts and loans is placed in the same position as direct expenditure by the firm within its own works or laboratories for research purposes, related to the firm's trade, being allowed as a business expense before the assessment of tax.

7. Special Recommendations.

(a) *Industrial Concerns with their own Research Departments.*

We recommend that industrial concerns with their own research departments should :

- (i) Wherever possible place research work with their local Technical College.
- (ii) Consult them when an outside opinion or specialised advice within their competence is required.
- (iii) Provide financial help and equipment where required, to increase their capacity for service to industry.
- (iv) Arrange for interchange of staff, for vacations and refresher courses and works visits from time to time.
- (v) Encourage the organisation by the College of a reference library and information service related to its field of activity.

- (vi) Generally develop the closest possible relations for their mutual benefit, including playing an active part on the governing bodies of local Technical Colleges.

(b) *Trade Associations.*

- (i) Each Trade Association should ascertain which Technical Colleges in the country can be of assistance to the industries it represents.
- (ii) It should direct the attention of its members or related Research Associations to them and the facilities they possess or their potentialities for rendering service and should assist financially in the provision of equipment or personnel where necessary.
- (iii) It should also maintain contact with Regional Education Councils and Local Education Authorities concerned.

8. The Part the F.B.I. Industrial Research Secretariat can Play.

We believe that the Industrial Research Secretariat of the F.B.I. can play a useful and constructive rôle in bringing industry and Technical Colleges into close contact for the solution of industrial problems, and consultation generally.

The Secretariat can to some extent act as a clearing house, and we advise any industrial concern or association interested to make contact with the Secretariat, who possesses full details of the various Technical Colleges and their activities and potentialities.

We would welcome any approach from a Technical College to the Secretariat to obtain or make research and industrial contacts or information, or with regard to the initiation of staff exchange schemes. We suggest that Technical Colleges should be informed accordingly.

We wish to express appreciation of the Secretary's work in co-ordinating the replies to the questionnaire and contributing to the preparation of this report.

(Signed) Members of the Sub-Committee :

ROBERT PICKARD (*Chairman*)

W. T. K. BRAUNHOLTZ

ARTHUR P. M. FLEMING

EDWARD MEIGH

B. J. A. BARD (*Secretary*)

September, 1946.

APPENDIX 1].

RESEARCH IN TECHNICAL COLLEGES

MINISTRY OF EDUCATION CIRCULAR No. 94

DATED 8th APRIL, 1946

1. The main function of Technical Colleges is the advancement and dissemination of knowledge, especially knowledge of value to industry and those engaged in industry. Here the importance and educational value of Research work cannot be over-emphasised. "Experience has demonstrated that teaching of the highest type, especially in science and its applications, thrives best in an atmosphere of steady progress in the understanding of the subject taught. He who is still a student, who is still himself learning, whether it be new relationships of the most fundamental scientific nature, or sounder and more economical ways of applying scientific knowledge for the promotion of industry and the public welfare, can best guide those about to enter upon a professional career." Today it is more than ever important, if we are to restore and enhance our industrial position and attain full employment and an improved standard of life, to ensure that scientific and technical research is carried out as widely and intensively as possible and applied promptly to production. To such research the Technical Colleges should make their contribution and this Circular is directed to considering the types of research work best suited to Technical Colleges and the manner in which they can best be fostered and developed by Local Education Authorities, Principals and staff in their respective capacities.

2. A recent survey shows a limited variety of scope and practice in existing technical institutions. In a small proportion of the colleges individuals carry on independent research, both pure and applied, generally with a view to obtaining a higher degree. Some of the departments of leading Colleges are closely linked-up with local industry and undertake developmental research for individual firms. There are also a few Colleges which have research contacts through their staff with industry, both regionally and nationally. Taking the country as a whole, however, the total contribution from Technical Colleges has been comparatively small.

3. The attitude of many Local Education Authorities towards research in Technical Colleges appears to be somewhat negative. While a few provide equipment and allow those of their staff who engage in research to have a lighter teaching timetable, others give little or no encouragement. This position is unsatisfactory in the light of modern needs, and the time has come to recognise that research should be regarded as a normal and, indeed, an important function of the Technical Colleges.

4. Neither the Regulations of the Ministry nor the provisions of the Superannuation Act prevent research from being carried on in Technical Colleges so long as it is suitable and is compatible with teaching duties. Difficulties, however, sometimes arise on the interpretation of suitability and on the particular circumstances of the teacher's employment.

5. In making provision for research facilities, Local Education Authorities should be guided by the following considerations :

- (i) The suitability of a teacher, both temperamentally and intellectually, to undertake research work. A teacher wishing to undertake

research should provide evidence of his capability ; for example, by the production of a first research paper, either based on his own work or on work carried out in association with another member of the staff, or in any other way that may be appropriate.

- (ii) Having provided satisfactory evidence of his capabilities, the teacher should be given facilities to undertake the type of research work in which he is interested. The extent of these facilities will, of course, depend upon the nature of the research to be pursued. Where an outstanding investigator, as the result of his published work, attracts senior students to the College for training in research methods, his work with them will naturally fall into the same category as ordinary teaching. Every encouragement should be given to the development of such schools of research which enhance the reputation of the College no less than that of the investigator. The provision of adequate laboratory equipment and laboratory assistance is an important contribution to success.
- (iii) Probably the most important and suitable type of research for teachers in Technical Colleges is applied research undertaken at the direct or indirect suggestion of industry and commerce. Here the value of the work is two-fold : first, it brings the College and teaching staff into close contact with industry and commerce to the general benefit of students and teachers alike, and secondly, it establishes direct relations between industry and commerce and the advanced work of the College.

This type of investigation, being mainly of a developmental character, will be of particular service to local industry, and especially smaller firms. Where the Technical College possesses special apparatus or equipment not otherwise available, its use should be at the service of industry, particularly local industry.

In some colleges it has been the practice to carry out a certain amount of routine testing on behalf of local industry. This should only be done when industrial facilities are not available. It can have only limited educational value for the teacher or the student and time spent in such work cannot be included as " actual teaching time " as described in paragraph (iv) below.

The results of research should be published as soon as possible after completion, subject, where appropriate, to an agreed delay to allow the firm paying for the work to have priority in their application, and subject also, where necessary, to consideration of Patent possibilities. Where fees are to be paid from outside sources, an equitable arrangement should be agreed upon beforehand as to the allocation to be made between the teacher concerned and the College Authorities.

- (iv) It is not desirable to be too rigid in defining the volume and character of the research work which can appropriately be undertaken in Technical Colleges. Much will depend on the interest of the individual worker and the needs of local industry. In some cases it may be desirable to give considerable latitude to a member of the

staff who may engage on a piece of research of pressing importance to a particular firm or organisation. The main limiting factor is the need to ensure that sufficient teaching service is rendered to constitute full-time teaching service for superannuation purposes. The minimum number of hours which may in general be regarded as constituting full-time teaching service is 1,080 a year, of which at least three-fifths must be devoted to "actual teaching." "Actual teaching" includes duties connected with teaching, such as organisation, preparation and the marking of papers. Where research work involves the actual instruction of students it may properly be included under the heading "actual teaching." It is very desirable that teachers should carry out research with their senior students who will thus gain invaluable experience in research methods and the research approach to scientific and industrial problems. Other research work which is related to teaching will fall within the remaining two-fifths of the minimum time required.

There may be cases where it will be desirable for a teacher to devote the whole of his time within College for a limited period to a particular piece of research, or so much of his time that he cannot be regarded as continuing in full-time teaching service. In such cases the period may be treated as contributory service for superannuation purposes under the terms of paragraph (vi) of Rule 2 (2) of the Teachers' Superannuation Provisional Amending Rules, 1945, if the work is in fact related to his service as a teacher.

- (v) As it is in the national interest that industry should be able to obtain the best and most up-to-date scientific advice, any scientist or technologist serving on the staff of a Technical College, who is competent to act as a consultant to industry, more particularly local industry, should be encouraged to do so, subject to what has been said above and within the following limits :

- (a) The work should not interfere with the proper discharge of his teaching duties.
- (b) No agreement should be made which would restrict his service to any one firm, except in respect of some specific inquiry.

- (vi) Local Education Authorities and Principals of Colleges should be aware that grants through the Department of Scientific and Industrial Research* are available to assist individual research workers in this country. These grants take the form of maintenance allowances, where needed, for research students and financial help towards the employment of assistants (laboratory and clerical) or for purchasing special equipment not usually available. Normally, the maintenance allowances are to encourage qualified students to undergo training in research at some university or a similar institution engaged on fundamental research, and are, therefore, likely to be of special value to promising students who hitherto

* Notes on grants awarded by the Department of Scientific and Industrial Research to Research Workers and Students—published by H.M. Stationery Office in 1945 (2d.)

have only been able to attend the College part-time and wish to avail themselves of full-time research work. The grant towards assistants and apparatus may enable a member of staff who is engaged on a piece of important fundamental research to acquire help which it would not be reasonable to look to the Local Education Authority to provide.

Grants in aid of research work are also made in suitable cases to individuals by various professional and other bodies, including the Royal Society.

- (vii) Research into statistical methods and the principles of industrial administration and their application, which are of great and growing importance, should not be overlooked. Attention should be given wherever practicable to the pursuit of such research including especially tuition of advanced students.

(Signed) JOHN P. R. MAUD.

ORGANISATIONS INTERESTED IN SCIENTIFIC AND TECHNICAL EDUCATION*

For the various professional Institutes, etc., interested in specialised branches of scientific and technical education, see the Directory of Organisations, pages 279-296.

Association of Science Masters, *Hon. Secretary* : R. H. Dyball, City of London School, London, E.C.4. (Central 0046).

Association of Women Science Teachers, *Secretary* : Miss L. E. Higson, 11, Fillebrook Hall, Fillebrook Road, Leytonstone, London, E.11. (Leytonstone 3991).

Association of Principals of Technical Institutions, *Hon. Secretary* : A. W. Gibson, Dudley and Staffs. Technical College, Dudley. (Dudley 2830).

Association of Teachers in Technical Institutions, *Secretary* : A. E. Evans, Hamilton House, Mabledon Place, London, W.C.1. (Euston 2442).

Association of Technical Institutions, *Hon. Secretary* : J. C. Jones, The Polytechnic, Regent Street, London, W.1. (Langham 2020).

British Association for Commercial and Industrial Education, *Secretary* : E. Whitehead, 107, Baker Street, London, W.1 (Welbeck 4531).

*This list does not form part of the F.B.I. Report nor of its Appendices.

APPENDIX 2]

**TECHNICAL COLLEGES with RESEARCH ACTIVITIES
and FACILITIES LIKELY TO INTEREST INDUSTRY**

As at 1st January, 1947

**Information kindly provided by the Association
of Principals of Technical Institutions**

(N.B.—Not all the Colleges in this Appendix
were included in the Survey)

Name of College	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
Accrington Technical School	Materials Testing and fine measurement	
Acton Technical College	Chemistry; Hydraulics Physics Telecommunications	
Barnsley Mining and Technical College	Mining	
Bath Technical College		Engineering : Electrical Mechanical
Belfast College of Technology	Chemistry Engineering : Electrical Mechanical	
Birmingham Central Technical College	Bakery; Chemistry Pharmacy	
Blackburn Municipal Technical College		Chemistry; Engineering Physics; Textiles
Blackpool Technical College and School of Art		Building; Chemistry Engineering; Physics
Bolton Municipal Technical College	Chemistry	Engineering Textiles
Bradford Technical College	Chemistry Engineering : Electrical Mechanical Pharmacy; Physics Textiles and Dyeing	
Bridgend Mining and Technical Institute	Chemistry	
Brighton Technical College	Chemistry Engineering : Electrical Mathematics	Botany Pharmacy Physiology Zoology

Name of College	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
Burnley Municipal College	Chemistry	Engineering Textiles
Cardiff Technical College	Chemistry; Commerce Mathematics Pharmacy; Physics	Engineering
Chelmsford Technical College and School of Art	Chemistry Engineering Physics	Biology
Coalville Mining and Technical Institute	Mining	
Coventry Technical College		Engineering : Automobile; Electrical Production
Croydon Polytechnic	Chemistry; Engineering	Biology; Physics
Dagenham South East Essex Technical College	Biology; Chemistry Commerce; Engineering Mathematics; Physics	
Derby Technical College	Setting up a Research Council to stimulate research	
Doncaster Technical College	Engineering : Electrical Mining	Engineering : Mechanical
Dudley and Staffordshire Technical College		Engineering : Materials and Structures Production, including Metrology
Enfield Technical College		Chemistry; Metallurgy Production Engineering
Gillingham, Medway Technical College,	Biology Chemistry	
Glasgow Royal Technical College	Chemistry Engineering : Civil; Electrical Mechanical; Mining Metallurgy; Pharmacy	
Gloucester Technical College		Building; Commerce Engineering
Guildford County Technical College	Biology Chemistry	Engineering Physics

Name of College	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
Halifax Municipal Technical College	Chemistry; Commerce Engineering; Textiles	Mathematics Physics
Huddersfield Technical College	Biology; Chemistry Colour Chemistry Commerce: Dyeing Engineering: Mechanical Textiles	
Leeds Technical College	Food technology Mathematics	
Lincoln Technical College	Corrosion of metals Fuels Strength of materials	
LONDON: Battersea Polytechnic	Chemistry Engineering: Chemical; Civil; Electrical; Hydraulic; Mechanical Mathematics; Metallurgy; Physics	
Borough Polytechnic	Engineering: Electrical	Baking; Confectionery Chemistry—Dental Mechanics, Plastics Engineering: Electrical; Foundry Heating; Ventilation Mechanical; Production Refrigeration
Sir John Cass Technical Institute	Biology; Chemistry Mathematics; Metallurgy Physics	
Chelsea Polytechnic	Biology; Chemistry Geology; Mathematics Pharmacy; Physics	
City of London College		Commerce: Accountancy Business Administration Marketing
Leathersellers Technical College	Leather manufacture	
Northampton Polytechnic	Applied Optics Applied Physics Chemistry Engineering: Electrical Mechanical	

Name of College	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
LONDON—continued Northern Polytechnic	Acoustics; Botany Chemistry Musical Instruments Natural and Synthetic Rubber and Plastics Physics; Zoology	Building materials Constructional design Radio
Norwood Technical Institute	Chemistry	Biology Electronics
Paddington Technical Institute		Engineering : Electrical Physics
The Polytechnic (Regent St.)	Architecture; Biology Chemistry; Engineering Mathematics; Physics	
L.C.C. School of Printing	Book-binding Letterpress, Lithography and Photogravure Printing, Stereotyping and Electrotyping and Type Casting Paper Making and testing Photolithographic plate-making Printing ink making and testing Printing metallurgy	
L.C.C. School of Photo-Engraving and Lithography	Colour printing Photo-engraving Photography	
South East London Technical Institute		Electric Welding Engineering : Electrical Mechanical Telecommunications Television
Westminster Technical Institute		Cooking and catering
Woolwich Polytechnic	Chemistry; Physics Engineering : Electrical	Engineering : Mechanical
Loughborough College	Chemistry; Hydraulics Engineering : Electrical Production	Engineering : Aeronautical Civil

Name of College	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
Manchester College of Technology	Chemistry Pure and Applied Engineering : Electrical Mechanical Municipal Industrial Administration Physics Textile Chemistry Textile Industries	
Manchester — Newton Heath Municipal Technical School		Rubber Technology
Middlesbrough—Constantine Technical College		Chemistry Engineering Metallurgy
Newcastle-upon-Tyne Rutherford Technical College		Engineering : Electrical Organic Chemistry
Northampton College of Technology (Northamptonshire)	Applied Chemistry and Physics of Leather manufacture	
Norwich City College and Art School	Biology	
Nottingham	Chemistry	Commerce ; Science Textiles
Oxford Schools of Technology, Art and Commerce		Engineering
Plymouth and Devonport Technical College	Biology ; Chemistry Engineering ; Pharmacy	
Preston—Harris Institute		Engineering : Mechanical
Rochdale Technical College	Metrology	
Rotherham—College of Technology and Art	Chemistry Engineering : Mechanical Electrical Metallurgy	

Name of Colleges	Existing Research Activities and Departments in which research is carried out	Departments in which facilities for research are available, but in which research is not at present being carried out
St. Helens Municipal Technical College	Chemistry	
Salford, Royal Technical College		Building ; Chemistry Engineering : Electrical Mechanical Structural Physics ; Textiles
Smethwick Municipal College		Chemistry (Inorganic) Physics Production Engineering
Stoke-on-Trent, North Staffordshire Technical College	Ceramics	
Stroud and District Technical College	Applied Chemistry Woollen Textiles	
Sunderland Technical College	Pharmacy Pure Science	
Treforest School of Mines and Technology		Mining
Walthamstow South West Essex Technical College	Chemistry ; Commerce Electronics ; Mathematics Physics ; Zoology	
Wednesbury—County Technical College	Metallurgy	Production Engineering and Metrology
Wigan and District Mining and Technical College	Biology ; Chemistry Engineering ; Physics Mining and Geology	
Wolverhampton and Staffs. Technical College	Chemistry—Oils and Varnishes	Building ; Chemistry Engineering : Electrical Mechanical Metallurgy ; Metrology
Worksop County Technical College	Mining	

Research Laboratories of Private Firms

THIS list has been completely revised since the last edition, by means of the kind co-operation of the contributing firms in bringing their entries up-to-date. Further, two new items of information were sought from each firm, *i.e.* the number of qualified research staff employed (staff with university degrees or equivalent qualifications), and the name of the information officer.

Many new entries have also been made, and the list now includes over 270 firms carrying out industrial research in the United Kingdom. It is still, however, far from complete, and any firm which feels that its research activities should be included in the next edition is invited to get in touch with the publishers.

All the information given was obtained directly from the firms concerned; the same form of inquiry was submitted to all, and the omission or inclusion of any particular item was left entirely to their discretion. In some cases, items such as the number of staff, extent of accommodation, or expenditure on research and development, had to be omitted because of changes and expansion taking place within the organisation.

For reasons of space, details of publications have had to be cut down, but we have tried to give a general indication of where the results of research may be found, by naming the scientific and technical periodicals in which the relevant papers have appeared.

NOTE. The inclusion of a firm in this list must not be taken to mean that it will undertake research work for outside bodies, although some of the firms listed do in fact offer consultant facilities—see Directory of Consultants.

ABRIL CORPORATION (GREAT BRITAIN), LTD., 25, Hanover Square, London, W.1.

Laboratory : Golden Nile Works, Bridgend.

Subject of Research : Synthetic waxes, emulsifiers, synthetic sweetening agents, fatty acids and derivatives.

Research Director : C. D. Moore.

Number of Qualified Staff : 12.

Annual Expenditure : £15,000.

AERO RESEARCH, LTD., Hinxton Road, Duxford, Cambridge.

Laboratory : As above.

Subject of Research : Adhesives; bonding materials; wet strength paper.

Research Director : N. A. de Bruyne, M.A., Ph.D., F.Inst.P.

Number of Qualified Staff : 7.

Floor Space : 1,500 sq. ft.

Publications : Monthly Bulletins are issued by the firm.

Information Officer : F. B. Priest.

Annual Expenditure : £5,500.

EDGAR ALLEN & CO., LTD., Imperial Steel Works, Sheffield, 9.

Laboratory : As above.

Subject of Research : Properties of high speed and other cutting tools, magnetic alloys, hot and cold die steels, stainless and heat-resisting steels; radiographic examinations of steel castings, etc.

Director of Research and Chief Metallurgist : Edwin Gregory, Ph.D.(Lond.), M.Sc., M.I.M.E., F.R.I.C., F.I.M.

Number of Qualified Staff : 9.

Floor Space : 2,750 sq. ft.

Information Officers : E. N. Simons and C. C. Linstead.

ALLEN & HANBURY'S, LTD., Bethnal Green, London, E.2.

Laboratory : Ware, Herts.

Subject of Research : Chemical, pharmaceutical and food products.

Chief Chemist : N. Evers, B.Sc., Ph.D., F.R.I.C.

Information Officer : G. R. Boyes, L.M.S.S.A., B.Sc., Ph.C., F.R.I.C.

ALUMILITE & ALZAK, LTD., 40, Brook Street, London, W.1.*Laboratory* : Thames Factory, Rainville Road, London, W.6.*Subject of Research* : Surface finishing of aluminium and magnesium, including electro-polishing, anodic oxidation and dyeing.*Technical Director* : V. F. Henley, B.Sc., F.R.I.C.*Number of Qualified Staff* : 6. *Floor Space* : 3,000 sq. ft.*Librarian and Intelligence Officer* : Miss A. Schwarcz, B.Sc.**AMALGAMATED COTTON MILLS TRUST, LTD.,** Arkwright House,

Manchester, 3.

Laboratory : As above.*Subject of Research* : Cotton and rayon spinning and weaving, and processes incidental thereto.**ANCHOR CHEMICAL CO., LTD.,** Clayton, Manchester, 11.*Laboratory* : As above.*Subject of Research* : Factice (rubber substitute), sulphurised oils, compounding ingredients for rubber, synthetic rubber, latex, etc.*Research Director* : J. H. Carrington, B.Sc., A.R.I.C., F.I.R.I.*Number of Qualified Staff* : 7. *Floor Space* : 4,500 sq. ft.*Publications* : Papers in *Trans. Inst. Rubber Industry*, etc. *Procs. Rubber Congress*, Paris, 1937. *Procs. Rubber Technology Conference*, London, 1938.**ANDRE RUBBER CO., LTD.,** Hook Rise, Kingston By-Pass, Surbiton, Surrey.*Laboratory* : As above.*Subject of Research* : Bonding of rubber to metals; compounding of natural and synthetic rubbers for applications in the engineering, chemical and allied trades; physical and chemical properties of compounded rubbers.*Research Director* : S. Buchan, M.A., B.Sc., Ph.D., F.R.I.C., A.I.R.I.*Floor Space* : 2,300 sq. ft.*Publications* : *Elastomeric Engineering, Developments in Rubber*.**ANGLO-AMERICAN OIL CO., LTD.,** *see* ESSO DEVELOPMENT CO., LTD.**ANGLO-IRANIAN OIL CO., LTD.,** Britannic House, Finsbury Circus, London, E.C.2.*Laboratory* : Sunbury-on-Thames.*Subject of Research* : Refinery processes; catalytic reactions; and the development of new products from petroleum refineries.*Research Director* : Sir Frank Smith, G.C.B., G.B.E., D.Sc., LL.D., F.R.S.*Floor Space* : 70,000 sq. ft.*Publications* : Mostly in *Procs. Inst. Petroleum*.**GEORGE ANGUS & CO., LTD.,** Angus House, Westgate Road, Newcastle-upon-Tyne, 1.*Laboratory* : As above and Bentham, nr. Lancaster.*Subject of Research* : Synthetic rubber; leather; textiles.*Chief Chemist* : M. Balkin, M.Sc., Ph.D., A.R.I.C.*Number of Qualified Staff* : 12.**APLIN & BARRETT, LTD.,** Yeovil, Somerset.*Laboratory* : As above, and eight branch laboratories.*Subject of Research* : Bacteriological, chemical and technical aspects of handling liquid milk and manufacture of dairy products, meat and fish products, and bakery products.*Research Director* : E. L. Crossley, B.Sc., F.R.I.C.*Publications* : Papers in *J. Dairy Research*, *J. Hygiene* and *Procs. Soc. Agricultural Bacteriologists and Analysts*.**ARC MANUFACTURING CO., LTD.,** 52A Goldhawk Road, London, W.12.*Laboratory* : 60B, Craven Park Road, Harlesden, London, N.W.10.*Subject of Research* : Welding of metals.*Research Director* : J. H. Paterson, D.Sc., F.R.I.C.*Floor Space* : 5,000 sq. ft.*Annual Expenditure* : £12,000.

ARDENTE ACOUSTIC LABORATORIES, LTD., Guildford, Surrey.

Laboratory : As above.

Subject of Research : Audio frequency equipment generally : microphones, loud speakers, amplifiers, test equipment for above, communication equipment, supersonic equipment for industrial and communication uses.

Research Director : P. W. Hickson, Sen. Mem. Inst. Radio Engineers (N.Y.).

ASHE LABORATORIES, LTD., 120-2, Victoria Street, London, S.W.1.

Laboratory : As above.

Subject of Research : Microbiological assays of vitamins and amino acids ; synthesis, isolation and applications of amino acids ; preparation and uses of 8: hydroxy-quinoline and its derivatives.

Research Director : Denis I. Duveen, F.R.I.C.

Number of Qualified Staff : 5.

Floor Space : 2,000 sq. ft.

Information Officer : F. B. Marmoy, A.R.I.C.

ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Crown House, Aldwych, London, W.C.2.

Laboratory : Aldermaston Court, Aldermaston, Berks.

Subject of Research : Long-term fundamental research in the physical sciences relating to engineering (in co-operation with research programmes at the British Thomson-Houston Co., Ltd., Rugby, and the Metropolitan-Vickers Electrical Co., Ltd., Manchester, *q.v.*)

Research Director : T. E. Allibone, D.Sc., Ph.D., M.I.E.E.

Floor Space : 10,000 sq. ft. ; to be increased.

ASSOCIATED PAPER MILLS, LTD., 53, New Broad Street, London, E.C.2.

Laboratory : c/o Cooke & Nuttall, Ltd., Horwich, Lancs., also seven branch labs.

Subject of Research : Paper and board making and coating.

Research Director : H. Ainsworth Harrison, M.Sc., Ph.D., F.R.I.C.

Number of Qualified Staff : 6.

Floor Space of Central Labs. : 3,500 sq. ft. *Annual Expenditure* : £7,500.

Publications : Papers in *Procs. Technical Sec. of the Papermakers' Assn.*

AUSTER AIRCRAFT, LTD., Britannia Works, Thurmaston, nr. Leicester.

Laboratory : Rearsby Aerodrome, Leics.

Subject of Research : Matters pertaining to light aircraft.

Chief Designer : R. F. Davis, A.F.R.Ae.S.

Number of Qualified Staff (Design and Research) : 18.

Floor Space : 150,000 sq. ft.

AUTOMATIC TELEPHONE & ELECTRIC CO., LTD., Strowger Works, Liverpool, 7.

Laboratories : As above and also at British Telecommunications Research Ltd., Taplow Court, Taplow, Bucks., and Hivac Limited, Harrow-on-the-Hill, Middlesex.

Subject of Research : Telecommunications.

Research Director : T. Walmsley, C.B.E., Ph.D., M.I.E.E., M.I.C.E., British Telecommunications Research Ltd., Taplow Court, Taplow, Bucks.

Publications : *The Strowger Journal*, papers in *J. Inst. Electrical Engineers* and *J. Inst. Post Office Engineers*.

BABCOCK & WILCOX, LTD., 34, Farringdon Street, London, E.C.4.

Laboratory : Renfrew, near Glasgow.

Subject of Research : Design, manufacture and operation of steam generating plant, combustion and heat exchange.

Research Director : C. Humphrey Davy, M.I.Mech.E.

Number of Qualified Staff : 25.

Floor Space : 20,000 sq. ft.

Publications : Papers in *Iron and Steel*, *Fuel in Science and Practice*, etc.

BAKER PLATINUM, LTD., 52, High Holborn, London, W.C.1.*Laboratory* : Not disclosed.*Subject of Research* : Chemistry and metallurgy of precious metals, particularly those of the platinum group. Field of research includes refining, purification, electro-deposition, powder metallurgy, the alloys and compounds of precious metals to meet demands of industry, etc.*Research Director* : A. G. Dowson, M.A., Ph.D.(Cantab.)*Floor Space* : 6,750 sq. ft.**BALDWIN INSTRUMENT CO., LTD.,** Brooklands Works, Dartford, Kent.*Laboratory* : Dartford.*Subject of Research* : Electrical properties of hygroscopic materials ; the measurement of Röntgen and Gamma radiation ; the quantitative measurement and control of light.*Research Director* : A. Love, A.R.T.C.*Number of Qualified Staff* : 4.*Floor Space* : 3,000 sq. ft.*Information Officer* : F. M. Peters.**M. BARR & CO., LTD.,** 51a, Miller Street, Glasgow, C.1.*Laboratory* : 110, Dobbie's Loan, Glasgow, C.4.*Subject of Research* : Woven fabrics, drying oils, synthetic resins ; synthetic plastics research in connection with the development of impregnated and coated fabrics, garments, etc. for weather, acid, alkali, solvent, bacteria resistance and for electrical insulation.*Research Director* : J. Milligan, A.R.I.C.*Floor Space* : 1,500 sq. ft.*Annual Expenditure* : £3,000.**GEO. BASSETT & CO., LTD.,** Owlerton, Sheffield.*Laboratory* : As above.*Subject of Research* : General confectionery, especially liquorice confections.*Research Director* : H. W. Bywaters, D.Sc.(Lond.), Ph.D., F.R.I.C.*Floor Space* : 2,000 sq. ft.*Annual Expenditure* : £4,000.**WILLIAM BEARDMORE & CO., LTD.,** 207, Shettleston Road, Glasgow, E.1.*Laboratory* : 101, Shettleston Road, Glasgow, E.1.*Subject of Research* : Properties of special alloy, stainless and heat-resisting steels for engineering applications at sub-normal, normal and elevated temperatures.*Research Director* : W. E. Goodrich, M.Met., A.M.I.Mech.E.*Number of Qualified Staff* : 12.*Floor Space* : 22,344 sq. ft.*Information Officer* : A. B. A. McCracken.**BEECHAM RESEARCH LABORATORIES, LTD.,** Brockham Park, Betchworth, Surrey.*Laboratory* : As above.*Subject of Research* : Pure and applied research in pharmaceutical, veterinary, food, toilet and cosmetic products.*Research Director* : W. McGeorge, B.Sc., F.R.I.C.*Number of Qualified Staff* : 53.*Floor Space* : Laboratories, 17,440 sq. ft. ; Animal House, 1,808 sq. ft. ; Pilot Plant, 4,886 sq. ft. *Total* : 24,134 sq. ft.*Information Officer* : I. Gellman, B.Sc.**BERTRAMS LTD.,** St. Katherine's Works, Sciennes, Edinburgh, 9.*Laboratory* : As above.*Subject of Research* : Drying of liquids, vegetables, chemicals, slurries, etc., by the roller process ; manufacture of paper and boards.*Research Director* : W. Walker.*Floor Space* : 1,260 sq. ft.

J. BIBBY & SONS, LTD., King Edward Street, Liverpool, 3.*Laboratory* : Great Howard Street, Liverpool, 3.*Subject of Research* : Seed crushing, extracting, vegetable oil refining, soap manufacture, chemistry of oils and fats, vitamins, proteins, etc.*Research Director* : H. Jasperson, Ph.D., B.Sc., F.R.I.C.*Number of Qualified Staff* : 7.*Floor Space* : 6,000 sq. ft.*Information Officer* : Miss D. B. Cole.*Publications* : Papers in *Biochem. J.* and *J. Soc. Chem. Ind.***2. Laboratory** : Biological Research Laboratory, Weatherstones, Windle Hill, Neston, Cheshire.*Subject of Research* : Poultry nutrition and diseases, vitamin and pigment estimation in milk, eggs and feeding-stuffs.*Research Director* : T. B. Mann.*Floor Space* : 2,915 sq. ft.*Publications* : Papers in *The Analyst* and *J. Agric. Science*.**BIOGLAN LABORATORIES, LTD., THE,** Ponsbourne Manor, nr. Hertford.*Laboratory* : As above.*Subject of Research* : Glandular research (endocrine products).*Research Directors* : A. Menzies Sharpe, F.F.Sc., M.Inst.B.E.; Karl B. Edwards, B.Sc., Ph.D.(Lond.), F.I.C.; Cyril Edwards, M.P.S.*Number of Qualified Staff* : 3.**ALFRED BIRD & SONS, LTD.,** Devonshire Works, Birmingham, 12.*Laboratory* : As above.*Subject of Research* : Food manufacturing, processing and packaging methods and chemical research in relation thereto.*Research Director* : R. S. Potter, B.Sc., F.I.C.*Number of Qualified Staff* : 3.**BLACKBURN AIRCRAFT LTD.,** Brough, East Yorks.*Laboratory* : As above.*Subject of Research* : Experimental research in applied aerodynamics; theoretical research in fluid dynamics.*Research Director* : W. S. Coleman, Ph.D., B.Sc., A.C.G.I., D.I.C.*Number of Qualified Staff* : 3.*Floor Space* : 8,700 sq. ft.**FREDK. BOEHM, LTD.,** "Rowanhurst", Grove Road, Beaconsfield, Bucks.*Laboratory* : "Brenchley", Penn Road, Beaconsfield, Bucks.*Subject of Research* : Proteins; varnish resins; yeast extracts and enzymes; aromatics.*Research Director* : A. A. Houghton, Ph.D.*Annual Expenditure* : £3,500.**THOMAS BOLTON & SONS, LTD.,** Mersey Copper Works, Widnes, Lancs.*Laboratory* : Froghall, N. Staffs.*Subject of Research* : Copper and copper base alloys; composition and properties development of production technique.*Research Director* : W. Cartwright, M.Sc., F.I.M., F.R.S.A., M.Inst.Met.*Number of Qualified Staff* : 3 at present; normally 4 or 5.*Floor Space* : 5,500 sq. ft.**JAMES BOOTH & CO., LTD.,** Argyle Street, Nechells, Birmingham, 7.*Laboratories* : At each of the Company's works.*Subject of Research* : Non-ferrous metals—development of new alloys and applications; development of manufacturing technique; development of various processes used in connection with the fabrication and manipulation of strong light alloys and copper base alloys.**BOOTS PURE DRUG CO., LTD.,** Station Street, Nottingham.*Laboratory* : As above.*Subject of Research* : Chemical, pharmacological, bacteriological, horticultural, agricultural and veterinary research concerned with a wide variety of medicinal and therapeutic substances, fungicides, pest-control agents and disinfectants.*Research Director* : Sir Jack Drummond, D.Sc., F.R.I.C., F.R.S.*Number of Qualified Staff* : 60.

BORAX CONSOLIDATED, LTD., Northgate House, 20-24, Moorgate, London, E.C.2.

Laboratory : Regis House, King William Street, London, E.C.4.

Subject of Research : Production and industrial applications of boric acid, borax and other salts of boric acid.

Annual Expenditure : £15,000-£20,000.

BOWATER'S PAPER MILLS, LTD., Northfleet, Gravesend, Kent.

Laboratory : As above.

Subject of Research : Papermaking.

Research Director : A. Baker, F.R.I.C., M.I.Chem.E. *Chief Engineer* : S. E. Walmsley, M.I.Mech.E. *Chief Chemist* : G. F. Underhay, B.Sc.

BRADLEY & FOSTER LIMITED, see STAVELEY COAL AND IRON CO.

BRAND & CO., LTD., Mayfair Works, Vauxhall, London, S.W.8.

Laboratory : As above.

Subject of Research : Food manufacture and processing research.

Research Director : R. Gillies.

Number of Qualified Staff : 4.

Floor Space : 1,500 sq. ft.

Annual Expenditure : £3,500.

BRITISH ALUMINIUM CO., LTD., THE, Salisbury House, London Wall, London, E.C.2.

Laboratory : Chalfont Park, Gerrards Cross, Bucks.

Subject of Research : Production and fabrication of aluminium, magnesium and their alloys, including the production of hydrated and calcined alumina. Sections are devoted to electro-chemistry, carbon electrode problems, physical and analytical chemistry, metallurgy, physics, corrosion and protection and finishes.

Research Director : C. J. Smithells, M.C., D.Sc.

Number of Qualified Staff : 40.

Publications : Papers in *The Analyst*, *J. Soc. Chemical Industry*, *J. Inst. Metals*, *Metal Industry* and *Trans. Faraday Soc.*

Information Officer : F. Horn (Salisbury House).

BRITISH BELTING & ASBESTOS, LTD., Scandinavia Mills, Cleckheaton, Yorks.

Laboratory : As above.

Subject of Research : Asbestos yarns, cloth, tapes, packings and jointings ; machinery belting and webbings ; 'Mintex' brake and clutch linings and other friction materials.

Research Director : C. G. Addingley, B.Sc., Ph.D., F.R.I.C.

Publications : Papers in *Procs. Inst. Mech. Engineers*, *Procs. Inst. Automobile Engineers*, and *Trans. Inst. Rubber Industry*.

BRITISH CELLULOSE LACQUERS, LTD., 24, Kangley Bridge Road, London, S.E.26.

Laboratory : As above.

Subject of Research : Development cellulose lacquers, paints, varnishes for special purposes ; materials for leather, electrical, furniture, metal working industries, etc.

Floor Space : 3,000 sq. ft.

BRITISH DRUG HOUSES, LTD., THE, Graham Street, City Road, London, N.1.

Laboratory : As above.

Subject of Research : Medical products including chemotherapeutic agents, vitamins, hormones and bacteriological products. Reagents for research and analyses. Chemical, biochemical (including nutritional), pharmacological, bacteriological, pharmaceutical investigations. Biological standardisations. Analytical methods. B.D.H. is a Member Company of the Therapeutic Research Corporation, *q.v.*

Research Manager : W. Bradley, Ph.D., M.Sc.

Awards : B.D.H. Fellowship to University College Hospital.

Publications : Papers in *The Analyst*, *Biochemical J.*, *Brit. J. Experimental Pathology*, *J. Soc. Chemical Industry*, *Lancet*, *Nature* and *Quarterly J. Pharmacology*.

BRITISH FERMENTATION PRODUCTS, LTD., 46, Putney Hill, London, S.W.15.

Laboratories: Chieftain Works, London, S.W.15, and at Ipswich.

Subject of Research: Bakers' yeast, dried yeast, yeast by-products, vitamin preparations, food products.

Research Director: N. Norman.

Floor Space: 4,000 sq. ft.

BRITISH FILTERS, LTD., Old Court, Cox Green, Maidenhead, Berks.

Laboratory: As above.

Subject of Research: All filtration problems.

Research Director: R. G. Allen, B.Sc.

Number of Qualified Staff: 5.

Floor Space: 3,072 sq. ft. *Annual Expenditure:* £12,000 last financial year.

Publications: Papers in *J. Sci. Instruments*, *Wireless World*, etc.

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 103, Mount Street, London, W.1.

Laboratories: 38, Wood Lane, London, W.12; Prescott, Lancs.; Kirkby, Lancs.; Helsby, Cheshire.

Subject of Research: Power, telephone and radio cables; paper, rubber and plastic dielectrics, electrical meters, welding machines, magnetic moulding machines, paper electrolytic, mica and ceramic capacitors, non-ferrous metallurgy, high voltage industrial heating applications and overhead lines.

Chief Engineer (Research): L. G. Brazier, Ph.D., B.Sc.(Eng.), M.I.E.E., A.F.R.Ae.S.

Chief Electrical Engineer (co-ordinating research programme generally): J. L. Miller, D.Eng., Ph.D., M.I.E.E., M.Amer.I.E.E., F.Inst.P.

Number of Qualified Staff: 81.

Floor Space: 92,000 sq. ft.

Awards: Awards are made from time to time.

Publications: Papers in *Electrical Industries*, *J. Inst. Elec. Engineers*, and *Nature*.

BRITISH OXYGEN CO., LTD., THE, Grosvenor House (6th Floor), Park Lane, London, W.1.

Laboratory: Morden Factory Estate, Morden Road, London, S.W.19.

Director of Research and Development: J. R. Park, M.Sc., A.R.I.C.

BRITISH PAINTS LTD., Britannic Works, Portland Road, Newcastle-upon-Tyne.

Laboratory: As above.

Subject of Research: Paint, varnishes, surface coatings of all types, synthetic resins and drying oils; plastics; dyestuffs; pigments.

Research Director: G. Weatherston, A.R.I.C.

Number of Qualified Staff: 11.

Awards: International Scholarship scheme.

Information Officer: W. P. Jenkins, Chief Chemist.

BRITISH PERICLASE CO., *see* **THE STEETLEY CO.****BRITISH PHYSICAL LABORATORIES,** Quadrant Works, Finchley Lane, London, N.W.4.

Laboratory: The Houseboat, Radlett, Herts.

Subject of Research: Development and design of measurement equipment for electrical components and quantities.

Research Director: Dr. V. A. Sheridan, A.M.I.E.E., F.Phys.S.

Floor Space: 5,000 sq. ft.

Annual Expenditure: £5,000.

BRITISH PISTON RING CO., LTD., THE, Coventry.

Laboratory: As above.

Subject of Research: Metallurgy and design in relation to automobile components—particularly piston rings, cylinder liners, valve seat inserts, valve guides, and chill face tappets.

Research Director: T. R. Twigger, A.M.I.A.E., F.I.M.

Floor Space: 2,150 sq. ft.

Annual Expenditure: £6,000.

BRITISH PRECISION DIAMOND TOOLS, LTD., Ardmore Laboratory,
Robin Hood Lane, Sutton, Surrey.

Laboratory : As above.

Subject of Research : Diamond toolmaking; cold setting of lapped diamonds; universal diamond lapping machines; diamond die machinery; fine boring equipment for the production of aircraft engine components.

Research Director : F. C. Jearum, M.I.B.E., M.I.P.E.

Floor Space : 10,000 sq. ft.

Annual Expenditure : £5,000.

Publications : From H.M. Stationery Office.

BRITISH ROPES, LTD., Carr Hill, Doncaster.

Laboratory : As above.

Subject of Research : Metallurgical, physical and analytical research applied to metals, fibres, and all materials pertaining to the manufacture of metal and fibre ropes.

Research Director : P. Woodhead, M.Inst.Metals, etc.

Number of Qualified Staff : 3.

Floor Space : 5,445 sq. ft.

BRITISH TELECOMMUNICATIONS RESEARCH LTD., *see* **AUTOMATIC TELEPHONE AND ELECTRIC CO., LTD.****BRITISH THOMSON-HOUSTON CO., LTD.,** Rugby.

Laboratory : As above.

Subject of Research : Radio and television; high frequency (generators and circuits); glass and ceramics; lamps; fluorescence; illumination; radiation physics; electronic valves; vacuum physics; electron optics; chemistry; metallurgy; mechanical testing; insulations.

Research Director : L. J. Davies, M.A., B.Sc.

Number of Qualified Staff : Approximately 100. *Floor Space* : 60,000 sq. ft.

Publications : In the scientific and engineering journals and *B.T.H. Research Laboratory Paper Series*.

BRITISH TIMKEN, LTD., Cheston Road, Aston, Birmingham, 7.

Laboratory : As above.

Subject of Research : Materials, heat treatment and lubrication problems connected with the manufacture and functioning of anti-friction bearings.

Metallurgist : J. H. Evans, F.I.M., M.Inst.Met., M.Iron and Steel Inst., M.Inst. Petroleum, M.Amer.Soc.Metals, M.A.S.T.M.

BRITISH TYRE AND RUBBER CO., LTD., Herga House, Vincent Square,
London, S.W.1.

Laboratory : Leyland, Lancs., and Burton-on-Trent.

Subject of Research : Rubber and synthetic materials.

Research Director : W. Bowden, F.I.R.I.

THOMAS BROADBENT & SONS, LTD., Huddersfield.

Laboratory : As above.

Subject of Research : "Centrifugal Separation" equipment—various types of centrifuges including semi-continuous centrifuges for investigating the application of centrifuges for all industrial purposes.

Research Director : F. Broadbent, B.Sc., A.M.Inst.Chem.Eng.

Floor Space : 1,650 sq. ft.

Awards : Leeds University Works Scholarship (3 years). Annual rewards averaging over £200 per year.

BROTHERTON & CO., LTD., City Chambers, Leeds, 1.

Laboratory : Central Research Department, Kirkstall Lane, Leeds, 5.

Subject of Research : Investigation of hydrosulphites and related products, ammonia, coal tar products, intermediates, and dyestuffs.

Research Manager : W. Cule Davies, D.Sc.(Wales), Ph.D.(Cantab.).

Number of Qualified Staff : 5.

Floor Space : 8,000 sq. ft.

Awards : *Leeds University* : Brotherton Research Lectureship in Physical Chemistry (Department of Textile Industry); Brotherton Lectureship in Chemical Engineering (Department of Coal, Gas and Fuel Industries with Metallurgy); Brotherton Research Lectureship in Physical Chemistry; Brotherton Research Fellowship in Physical Chemistry (Department of Colour Chemistry and Dyeing); Brotherton Research Assistant in Chemical Engineering; Brotherton Research Assistant in Physical Chemistry. *Liverpool University* : Brotherton Research Lectureship in Organic Chemistry.

Information Officer : A. H. Raine, B.Sc.(Leeds).

CHARLES BROWN & CO., LTD., Tower Bridge Flour Mills, Shad Thames
Bermondsey, London, S.E.1.

Laboratory : Royal Flour Mills, Vauxhall, London, S.E.11.

Subject of Research : Flour and flour milling.

Research Director : C. Key, M.Sc.(Lond.), A.R.I.C.

DAVID BROWN & SONS (HUDDERSFIELD), LTD., Park Works, Lockwood,
Huddersfield.

Laboratory : As above.

Subject of Research : Gear materials and lubricants; machine tools for gear manufacture; cutting tools and lubricants; fine measuring equipment.

Head of Research Department : W. A. Tuplin, D.Sc., M.I.Mech.E., M.I.A.E.

Number of Qualified Staff : 8.

Floor Space : 6,000 sq. ft.

Annual Expenditure £20,000.

Information Officer : Miss I. M. Ackroyd.

BRUNTONS (MUSSELBURGH), LTD., Musselburgh, Scotland.

Laboratory : As above.

Subject of Research : Cold working of steels.

Works Director : A. T. Adam, A.R.T.C., F.I.M.

Floor Space : 8,500 sq. ft.

BRUSH ELECTRICAL ENGINEERING CO., LTD., THE, Falcon Works,
Loughborough, Leics.

Laboratory : As above.

Subject of Research : Turbines, electrical equipment, internal combustion engines.

Research Director : G. H. Wray, M.I.Mech.E., M.I.Chem.E., F.I.M.

Floor Space : 6,540 sq. ft.

BRYSON PROCESSES LTD., 312, Sardinia House, Kingsway, London, W.C.2.

Laboratory : Irthlingborough, Northants.

Subject of Research : Consultants and original research. Synthetic resins; ion exchange resins; water soluble resins; and applications in plastics, adhesives, emulsions; paints, varnishes, distempers, leather finishes, rubber and paper; wetting agents.

Research Director : E. Leighton Holmes, M.Sc., A.R.C.S.

Publications : Papers in *J. Soc. Chemical Industry*, *Industrial Chemist*, *International Soc. Leather Trades Chemists*, *Paint Technology*, *Plastics*.

***B.S.A. GROUP RESEARCH CENTRE**, Greystones Hall, Box 94, Sheffield.
Laboratory : As above. This central research laboratory supports and extends work carried out in the laboratories of the individual firms comprising the B.S.A. Group of Companies.

Subject of Research : Physics, chemistry, metallurgy, and engineering.

Research Director : D. A. Oliver, M.Sc., F.I.M., F.Inst.P.

Number of Graduates : 22.

Floor Space : 6,000 sq. ft.

Annual Expenditure : £50,000.

Publications : Papers in *J. Iron and Steel Inst.*, *J. Inst. Metals*, *Metallurgia*, *J. Sci. Instruments*, etc.

Information Officer : A. G. Rimmer, B.Sc.

B.S.A. CO., LTD., Armoury Road, Small Heath, Birmingham, 11.

Laboratory : As above.

Subject of Research : Powder metallurgy, plastics and engineering.

Head of Laboratory : S. C. Wilsdon.

Number of Graduates : 5.

Floor Space : 5,000 sq. ft.

Annual Expenditure : £20,000.

B.S.A. TOOLS, LTD., Birmingham.

Laboratory : Mackadown Lane, Marston Green, Birmingham.

Subject of Research : Machinability, machine tools, small tools, and materials.

Research Director : As for B.S.A. Group Research Centre, *q.v.*

Head of Laboratory : K. J. B. Wolfe, M.Sc.

Number of Graduates : 4.

Floor Space : 4,000 sq. ft.

Annual Expenditure : £5,000.

Publications : In various scientific and technical papers and journals.

Information Officer : As for B.S.A. Group Research Centre, *q.v.*

BURMAH OIL CO., LTD., THE, Britannic House, Finsbury Circus, London, E.C.2.

Laboratory : Fairlawn, Honor Oak Road, Forest Hill, London, S.E.23.

Subject of Research : Chemistry and physics of petroleum and its products ; refinery developments ; refinery planning ; products manufacture and utilisation.

Research Director : W. J. Wilson, F.R.I.C., A.C.G.I., F.Inst.Pet.

Number of Qualified Staff : 6.

CADBURY BROTHERS, LTD., Bournville.

Laboratory : As above.

Subject of Research : Raw products ; packaging ; processes of manufacture ; properties of materials.

Research Director : R. V. Wadsworth, F.R.I.C.

CALICO PRINTERS' ASSOCIATION, LTD., St. James's Buildings, Oxford Street, Manchester, 1.

Laboratories : As above ; also at Branch Laboratories attached to Printing and Finishing Plants.

Subject of Research : Chemical, physical and technological research on textile fibres and fabrics and their bleaching, dyeing, printing and finishing.

Research Manager : G. S. Hibbert, M.Sc.(Vic.).

Floor Space : 17,000 sq. ft.

CAMBRIDGE INSTRUMENT CO., LTD., 13, Grosvenor Place, London, S.W.1.

Laboratory : Chesterton Road, Cambridge.

Subject of Research : Mechanical, electrical, chemical and medical instruments of precision.

Chief of Research Staff : M. C. Marsh, M.A., Ph.D.

Number of Qualified Staff : 5.

Floor Space : 10,000 sq. ft.

Technical Publicity Manager : S. L. Barron (Grosvenor Place).

* See also B.S.A. Co., Ltd. ; B.S.A. Tools, Ltd. ; and William Jessop & Sons, Ltd.

CAPE ASBESTOS CO., LTD., THE, Morley House, 26-30, Holborn Viaduct, London, E.C.2.

Laboratory : Harts Lane, Barking, Essex.

Subject of Research : Uses of asbestos in industry ; thermal insulation, friction linings, board materials, and asbestos-filled plastics material.

Research Director : J. D. Blakely, M.Sc., F.I.C.

Number of Qualified Staff : 3.

Floor Space : 6,000 sq. ft.

CARGO FLEET IRON CO., LTD., see SOUTH DURHAM STEEL & IRON CO., LTD.

CARRIER ENGINEERING CO., LTD., Carrier House, Catherine Place, London, S.W.1.

Laboratory : As above.

Subject of Research : Thermodynamics ; physics ; mechanical engineering ; industrial chemistry.

Research Director : C. L. Sainty.

CHANCE BROTHERS, LTD., Glassworks, Smethwick 40, Birmingham.

Laboratory : As above.

Subject of Research : Glasses ; properties, manufacture, treatment and uses ; study of raw materials, furnaces and machinery ; optical and specialised scientific glasses ; research and development on glass generally.

Research Director : W. M. Hampton, Ph.D., B.Sc., F.R.I.C., F.Inst.P., F.S.G.T., F.I.E.S.

Number of Qualified Staff : 11.

Floor Space : 10,050 sq. ft.

Annual Expenditure : £15,000.

Publications : *J. Soc. Glass Tech.* and various scientific journals. Information and Data Sheets.

CHRISTIE-TYLER, LTD., Trading Estate, Bridgend, Glamorgan.

Laboratory : As above.

Subject of Research : Scientific principles of seating for all purposes.

Research Director : Managing-Director, Bernard A. Christie. *Manager* : C. F. Eimerl.

Annual Expenditure : £5,500.

CLARKE, CHAPMAN & CO., LTD., Victoria Works, Gateshead, 8, Co. Durham.

Laboratory : As above.

Subject of Research : Marine auxiliaries, searchlight reflectors, water tube boilers.

Research Director : T. Thompson, M.Sc.

CLARKE NICKOLLS & COOMBS, LTD., Clarnico Works, Wallis Road, Victoria Park, London, E.9.

Laboratory : Unusable owing to enemy action. Work carried on in laboratory of neighbouring company.

Subject of Research : Chocolate and confectionery production.

Research Director : E. W. D. Deag.

CLUTSOM & KEMP, LTD., Highfields, Coalville, Leics.

Laboratory : As above.

Subject of Research : Elastic webbing.

Research Director : G. H. Lunge, M.A., D.Sc., F.R.I.C.

Floor Space : 2,000 sq. ft.

Publications : Papers in *J. Textile Inst.* and *India Rubber J.*

J. & P. COATS, LTD., 155, St. Vincent Street, Glasgow, C.2.

Laboratory : c/o Anchor Mills, Paisley.

Subject of Research : Research on all aspects of sewing thread and handicraft articles.

Research Director : J. M. Fletcher, M.A.(Oxon), Ph.D.

Number of Qualified Staff : 12.

COLAS PRODUCTS, LTD., 58, Waldegrave Park, Twickenham, Middlesex.
Laboratory : Atlas Works, Victoria Road, Willesden, London, N.W.
Subject of Research : Bituminous and other industrial emulsions—production and use ; general problems of emulsification.
Research Director : L. G. Gabriel, B.Sc., F.R.I.C., M.I.Chem.E.

COLVILLES, LTD., 195, West George Street, Glasgow.
Laboratory : Technical Offices, Crosshill Street, Motherwell.
Subject of Research : Scientific control of manufacture of carbon and alloy steels ; chemical, physical and mechanical properties of carbon and alloy steels with reference to service behaviour and requirements. Co-operative research in collaboration with the British Iron and Steel Research Association.
Research Director : W. Barr, A.R.T.C., F.I.M.
Number of Qualified Staff : 9. *Floor Space* : 13,000 sq. ft.

COMBINED OPTICAL INDUSTRIES, LTD., Slough.

Laboratory : As above.
Subject of Research : Manufacture of optical components in transparent plastic materials ; design of new optical instruments ; improvements in technique of plastic mouldings of all types.
Research Manager : J. Johnson, B.Sc. (Hons. Phys.).
Floor Space : 1,200 sq. ft. *Annual Expenditure* : £6,000.

A. C. COSSOR, LTD., Cossor House, Highbury Grove, London, N.5.
Subject of Research : Radio communications, including primarily the problems of normal broadcast and television reception, radar, cathode ray oscillography and associated technique. Electronics—valve and cathode ray tube design. High vacuum technique—electron emission, etc.
Research Director : L. H. Bedford, O.B.E., M.A., B.Sc., B.Sc.(Eng.), A.M.I.E.E., M.I.R.E., M. Brit. I.R.E.(Circuit Research Dept.) ; *Chief Valve Engineer* : F. T. Cotton, B.Sc.
Publications : Reports with restricted circulation to Government Departments etc., and papers in *Electronic Engineering*, *J. Brit. Inst. Radio Engineers*, *J. Brit. Kinematograph Soc.*, *J. Inst. Electrical Engineers*, *Philosophical Mag.*, *Procs. Physical Soc.*, *Wireless World*.

RICHARD COSTAIN LTD., Dolphin Square, London, S.W.1.
Laboratory : Keyes House, Basement, Dolphin Square, London, S.W.1.
Subject of Research : Physical and chemical testing of building materials.
Research Director : A. Sciver, B.Sc.(Lond.), F.R.I.C., F.I.S.E.

COURTAULDS, LTD., 16, St. Martin's-le-Grand, London, E.C.1.
Laboratory : Foleshill Road, Coventry.
Subject of Research : Manufacture of rayon yarns and rayon staple fibres from viscose, cellulose acetate, proteins, etc. ; utilisation of rayon yarns and rayon staple fibres in textiles ; production of thermoplastics.
Research Director : A. H. Wilson, M.A., F.R.S.
Floor Space : 131,000 sq. ft.

CREED & CO., LTD., Telegraph House, Croydon.
Laboratory : As above.
Subject of Research : Telegraph engineering.

CROOKES LABORATORIES, THE, LTD., Gorst Road, Park Royal, London, N.W.10.
Subject of Research : Nutritional medicine ; vitamins.
Research Director : J. C. Burgin, M.B., Ch.B.
Floor Space : 4,000 sq. ft.
Publications : Papers in *The Analyst*, *Biochemical J.*, and *Quarterly J. of Pharmacy and Pharmacology*.

CROSSE & BLACKWELL, LTD., Soho Square, London, W.1.

Laboratory : Crimscoot Street, Bermondsey, London, S.E.1.

Subject of Research : Manufacture and packing of food products (including bacteriological research).

Research Director : S. Back, B.Sc.(Lond.), F.R.I.C.

CROSSLEY BROTHERS, LTD., Openshaw, Manchester, 11.

Laboratory : As above.

Subject of Research : A wide range of subjects in connection with diesel engines, gas engines, petrol and paraffin engines.

Number of Qualified Staff : 5.

DE HAVILLAND AIRCRAFT CO., LTD., Hatfield Aerodrome, Hatfield, Herts.

Laboratory : Stag Lane, Edgware, Middlesex.

Subject of Research : Control and development of materials and processes relating to propellers, aircraft and power plants. Most of the work is domestic or for Government departments, but external contracts have been undertaken when related to the firm's work and industry.

Research Director : K. W. Clarke, A.I.M.

Number of Qualified Staff : 11.

Floor Space : 26,000 sq. ft.

DE HAVILLAND PROPELLORS LTD., Hatfield, Herts.

Laboratory (1) : Vibration Department, Engineering Division.

Subject of Research : Prototype testing, development and research in connection with vibratory and steady stress, vibration, and fatigue problems, in aeronautical and mechanical engineering; development of all necessary electronic and mechanical equipment. The research facilities of the laboratory are available to all branches of industry, as is the specialised electronic and mechanical equipment manufactured by the company.

Research Director : R. N. Hadwin, B.A., Chief Vibration Engineer.

Number of Qualified Staff : 13.

Floor Space : 8,500 sq. ft.

Publications : Paper in *Electronic Engineering*.

Laboratory (2) : Metrology Department.

Subject of Research : Establishment and upkeep of factory dimensional and surface finish standards. Research into inspection and gauging methods. Precise measurements undertaken for other Research Departments, in the companies of the de Havilland enterprise and for industry at large. Investigation of faults and failures from a dimensional viewpoint. A similar laboratory is established at the de Havilland propeller factory at Lostock, Bolton. The dimensional control and research facilities of both laboratories are available to all branches of industry.

Research Director : H. C. Pepper.

Number of Qualified Staff : 1.

Floor Space : 850 sq. ft.

DE LA RUE PLASTICS, LTD., Avenue Works, Walthamstow Avenue, London, E.4.

Laboratory : As above.

Subject of Research : Plastics materials and their development.

Research Director : R. B. Harley, B.Sc., A.R.I.C.

Publications : Papers in *British Plastics*.

DISTILLERS CO., LTD., THE, 8-12, Torphichen Street, Edinburgh.

Central Laboratory : Great Burgh, Epsom, Surrey. The Research Department controls various outlier Research Sections, at Tonbridge and Bromborough for example. It also maintains close touch with the Research Sections of the D.C.I.'s subsidiary companies.

Subject of Research : Production of yeast, chemicals by fermentation, industrial alcohol, solvents, plasticisers, plastics, antibiotics, etc.

Controller of Research and Development : F. Roffey, B.Sc., Ph.D., F.R.I.C.

Number of Qualified Staff : Approximately 150.

Floor Space : Approximately 50,000 sq. ft.

Manager of Patents and Information Division : E. H. Brittain.

DORMAN LONG & CO., LTD., Zetland Road, Middlesbrough.

1. *Laboratory* : Central Research Department, Newport Iron Works, Middlesbrough.
Subject of Research : Control and development of methods of manufacture, manipulation and application of iron, steel and kindred materials.

Chief Metallurgist : W. W. Stevenson.

2. Also By-Products Research Department :

Laboratory : Clarence Distillation Works, Port Clarence, Middlesbrough.

Subject of Research : Development of coal tar processing.

Chief Research Chemist : T. G. Woolhouse.

Information Officer : J. Murray.

DUBILIER CONDENSER CO. (1925) LTD., THE, Ducon Works, Victoria Road, North Acton, London, W.3.

Laboratory : As above.

Subject of Research : Dielectrics resistance and other materials applicable to the Company's products.

Technical Director : P. R. Coursey, B.Sc., M.I.E.E., F.Inst.P.

Floor Space : 5,000-6,000 sq. ft.

DUNLOP RUBBER CO., LTD., St. James's House, St. James's Street, London, S.W.1.

Laboratories : Fort Dunlop, Erdington, Birmingham. Cambridge Street, Manchester. Walton, Liverpool.

Subject of Research : Rubber and allied materials, and textiles.

Research Director : F. G. W. King, B.Sc., F.I.R.I., M.I.A.E. (at Fort Dunlop).

Information Officer : G. A. Shires, M.Sc. (at Fort Dunlop).

DUSSEK BITUMEN & TAROLEUM, LTD., King William Street House, Arthur Street, London, E.C.4.

Laboratories : Empress Wharf, Sherman Street, Bromley-by-Bow, London, E.C. ; Loushers Lane, Warrington, Lancs.

Subject of Research : Investigation of specific phenomena arising out of production of bitumen emulsion, electrical insulating compounds for electricity supply, radio, etc. Waterproofing and allied materials.

Research Director : E. R. Hart, M.I.P.

Number of Qualified Staff : 2.

Floor Space : 8,000 sq. ft.

Annual Expenditure : £6,000.

EDISON SWAN ELECTRIC CO., LTD., THE (RADIO DIVISION), 155, Charing Cross Road, W.C.2.

Subject of Research : Special Products Department ; specialised electro-medical equipment ; high frequency heating apparatus ; inter-office communication equipment, welding torches, and special electronic equipment of all kinds.

EDISON SWAN CABLES, LTD.

Subject of Research : Lamps ; Tungar. (Infra Red).

ELECTRIC FURNACE CO., LTD., "Netherby," Queen's Road, Weybridge, Surrey.

Laboratory : EFCo. Works, Leathley Road, Leeds, 10.

Subject of Research : Induction heat treatment of metals at frequencies ranging from 50 to 500,000 cycles.

Research Director : W. J. G. Cosgrave, B.Sc., A.I.M.

Number of Qualified Staff : 2.

Floor Space : 5,000 sq. ft.

Annual Expenditure : £5,000.

ELECTRIC & MUSICAL INDUSTRIES, LTD., Blyth Road, Hayes, Middlesex.

Laboratory : As above.

Subject of Research : Telecommunications, in particular television ; electronics ; sound recording and reproduction.

Research Director : I. Shoenberg.

EMERY BROS., LTD., Aston, Birmingham, 6.*Laboratory* : As above.*Subject of Research* : Cold rolled non-ferrous metals.*Research Director* : T. B. Crow, F.R.I.C., M.Sc., M.Inst.Met., Ph.D., O.A.E.*Publications* : Various.*Information Officer* : E. L. Williams, M.C., F.R.S.A.**ENFIELD CABLES, LTD.,** Millmarsh Lane, Brimsdown, Middlesex.*Laboratory* : As above.*Subject of Research* : Electric cables, general electric transmission, associated materials and accessories—examination, testing, design, development and research. High-voltage laboratories, general chemical and physical laboratories and specialised laboratories equipped with experimental manufacturing plant for the investigation of new materials and processes.*Research Director* : F. W. Main, M.I.E.E., etc.*Floor Space* : 15,000 sq. ft. *Annual Expenditure* : Up to £10,000.**ENGLISH CLAYS LOVERING POCHIN & CO., LTD.,** St. Austell, Cornwall.*Laboratory* : As above.*Research Director* : Appointment vacant.*Number of Qualified Staff* : 4.**ENGLISH METAL POWDER CO., LTD.,** Tavistock Road, West Drayton, Middlesex.*Laboratory* : As above.*Subject of Research* : All purposes concerning the manufacture, use, and application of metal powders, especially aluminium powders.*Research Director* : H. Meyersberg, Dr. ing.*Number of Qualified Staff* : 3. *Floor Space* : 1,000 sq. ft.**ERICSSON TELEPHONES, LTD.,** 22, Lincoln's Inn Fields, London, W.C.2.*Laboratory* : Telephone Works, Beeston, Nottingham.*Subject of Research* : Applied research : telecommunications and light engineering materials, processing and testing methods, circuit and system development ; paint, varnishes and metal powders.*Research Director* : A. Brookes, M.Eng., M.I.E.E.*Floor Space* : 13,000 sq. ft. *Annual Expenditure* : £50,000.*Publications* : Papers in *J. Inst. Electrical Engineers*, etc.**ESSEX AERO, LTD.,** Queen Street, Gravesend, Kent.*Laboratory* : As above.*Subject of Research* : Development of magnesium alloys, magnesium structures, magnesium aircraft, welded magnesium containers and structures, wrought magnesium.*Research Director* : R. J. Cross (Managing Director).*Assistant Manager* : D. B. Winter, A.M.I.Mech.E., A.F.R.Ae.S.*Chief Metallurgist* : E. F. Maillard, B.Sc., A.I.C., A.I.M.*Floor Space* : 5,000 sq. ft.*Information Officer* : F. A. Abbey, B.A.**ESSO DEVELOPMENT CO., LTD.,** 16, Charles II Street, Haymarket London, S.W.1.*Laboratories* : Esso European Laboratories at Esso House, Abingdon, Berks., and 85, Albert Embankment, London, S.E.11.*Subject of Research* : Manufacture, development, application and performance of all petroleum products, fuels and lubricants. Esso European Laboratories carry out research work required by the Anglo-American Oil Co., Ltd., and its associates, and by the Standard Oil Development Co. of America.*Research Manager* : C. S. Windebank, M.S., A.M.I.Chem.E., F.Inst.Pet.*Publications* : Papers in *J. Inst. Petroleum*, and other scientific and technical journals.

EVANS MEDICAL SUPPLIES, LTD., Speke, Liverpool, 19.*Laboratory* : The Evans Biological Institute, Runcorn, Cheshire.*Subject of Research* : Therapeutic remedies (including biological, chemotherapeutic and pharmaceutical compounds) for medical and veterinary use.*Research Director* : D. Riding, M.D., M.R.C.P.*Number of Qualified Staff* : 15.*Awards* : Yearly grant to the Biochemical Department at Liverpool University for post-graduate research. Student scholarships are also awarded from time to time.*Publications* : Papers in *Brit. Med. J.*, *J. Comp. Path.*, *Pharm. J.*, *Quart. J. Pharm.* and *S. African Pharm. J.**Information Officer* : Enquiries to the Medical Director.**WILLIAM EVANS & CO. (HEREFORD & DEVON), LTD.,** Widemarsh, Hereford.*Laboratory* : As above.*Subject of Research* : Apple products, particularly pectin.*Research Director* : W. R. Bufton, Ph.C., F.C.S.**WILLIAM EWART & SON, LTD.,** 17, Bedford Street, Belfast.*Laboratory* : Glenbank Bleach Works.*Subject of Research* : Flax and linen.*Research Chemist* : T. E. Ellison, D.Sc., A.I.C., A.T.I.**EXPRESS DAIRY CO., LTD.,** Tavistock Place, London, W.C.1.*Central Laboratories* : 133, Euston Road, London, N.W.1. Other laboratories at eight London depots and ten country creameries.*Subject of Research* : Dairy and food industries.*Research Director* : J. G. Davis, D.Sc., Ph.D., F.R.I.C.*Floor Space* : 20,000 sq. ft.*Publications* : Papers in *Analyst*, *Food Manufacture* and *Procs. Soc. App. Bacteriologists*.**FAIREY AVIATION CO., LTD., THE,** Hayes, Middlesex, and Heaton Chapel, Stockport.*Research and Aerodynamics Laboratories* : As above.*Subject of Research* : Various research groups including wind tunnel group ; physical and chemical characteristics of metals and plastics ; gyro and radio control, and other subjects allied to the firm's main aircraft development programme.**FERODO, LTD.,** Chapel-en-le-Frith, Stockport.*Laboratory* : As above.*Subject of Research* : Friction, synthetic resin, rubber.*Research Manager* : E. G. Hancock, M.A., M.Sc., F.R.I.C.*Number of Qualified Staff* : 10.*Information Officer* : Miss F. M. Heath, B.Sc., A.R.I.C.**FINE SPINNERS & DOUBLERS, LTD.,** St. James's Square, Manchester, 2.*Laboratory* : Research Department, Rock Bank, Bollington, nr. Macclesfield.*Subject of Research* : All matters concerning production and development of textile yarns spun from natural or man-made fibres.*Research Director* : F. P. Slater, M.C., M.A., M.Sc., F.T.I.**THOS. FIRTH & JOHN BROWN, LTD.,** Atlas Works, Savile Street, Sheffield.*Laboratory* : Brown-Firth Research Laboratories, Princess Street, Sheffield. These Research Laboratories incorporate the Firth-Vickers Research Laboratories which service Messrs. Firth-Vickers Stainless Steels, Ltd., Sheffield.*Subject of Research* : All aspects of the metallurgy of steels and ferrous alloys ; physical chemistry of steel-making ; investigation of corrosion and scale resistance ; study of refractories and moulding sands ; heat-treatment and transformation problems.*Research Director* : Dr. C. Sykes, Ph.D., D.Sc., F.Inst.P., F.R.S.*Floor Space* : 39,000 sq. ft.*Awards* : Scholarship at Cheltenham College to a boy proceeding to an engineering degree.*Publications* : Papers in *Engineering*, *J. Iron and Steel Inst.*, *Metallurgia*, *Trans. N.E. Coast Inst. Engineers and Shipbuilders*.

FISONS, LTD., Harvest House, Ipswich.*Laboratory* : Bramford Works, Nr. Ipswich.*Subject of Research* : Chemical fertiliser manufacture.*Research Director* : J. Watson Napier, B.Sc., M.I.Mech.E., M.I.Chem.E.*Number of Qualified Staff* : 16. *Floor Space* : 6,000 sq. ft.*Information Officer* : Miss S. B. Moody, B.Sc.**F.N.F., LIMITED.,** Burton on Trent, Staffs.*Laboratory* : As above.*Subject of Research* : Textile machinery, with particular reference to knitting machinery.*Research Director* : Robert Peel*Number of Qualified Staff* : 3.*Floor Space* : 6,000 sq. ft.*Publications* : In *Silk and Rayon* &c.**FOSTER, YATES & THOM, LTD.,** Blackburn. (Heavy Precision Engineers).*Laboratory* : Canal Works, Blackburn.*Subject of Research* : Investigation of physical properties under specific conditions.*Research Director* : Post temporarily vacant (communications to Chief Engineer).*Floor Space* : 11,000 sq. ft.**FOUNDRY SERVICES, LTD.,** Long Acre, Nechells, Birmingham, 7.*Laboratory* : As above.*Subject of Research* : Chemical treatment of molten metals and the treatment of moulds used in foundries for both sand and die casting.*Research Director* : Kossy Strauss, Dr.Eng., Dipl.Eng., F.C.S.*Number of Qualified Staff* : 1.*Floor Space* : 2,000 sq. ft.*Annual Expenditure* : £5,000.*Publications* : *Foundry Practice* (bi-monthly) and Information Sheets from time to time (see Periodicals Section, under Metals).*Information Officer* : R. A. Miller.**THOMAS FRENCH & SONS, LTD.,** Chester Road, Manchester, 15.*Laboratory* : Sharston Road Factory, Wythenshawe, Manchester.*Subject of Research* : Basic and applied research and development connected with : small metal products and light mechanisms ; narrow fabrics and textile materials of interest to narrow fabric trade ; a variety of other metallic and non-metallic materials and products.*Research Director* : J. Ainslie.*Floor Space* : 3,000 sq. ft.**FRY'S METAL FOUNDRIES, LTD.,** Tandem Works, Christchurch Road, Merton Abbey, London, S.W.19.*Laboratory* : As above.*Subject of Research* : Smelting and refining of tin, antimony and lead alloys ; development and application of printing metals ; solders and fluxes ; bearing metals.*Research Director* : J. Cartland, M.C., M.Sc.*Floor Space* : 2,500 sq. ft.**FUSARC, LTD.,** M.105, Kingsway, Team Valley Trading Estate, Gateshead, 11.*Laboratory* : As above.*Subject of Research* : Properties of weld metal and slags ; of fluxes for arc welding electrodes.*Research Director* : E. Hindson.*Floor Space* : 2,000 sq. ft.*Annual Expenditure* : £5,000.*Publications* : Frequent contributions to technical publications in the field of electric arc welding.

GAS LIGHT & COKE CO., THE, 30, Kensington Church Street, London, W.8.
Laboratory : As above.
Subject of Research : Manufacture and utilisation of the products of the carbonisation of coal.
Controller of Research : H. Hollings, D.Sc., F.R.I.C.
Number of Qualified Staff : 43.
Awards : Gas Research Fellowship at Imperial College of Science and Technology, South Kensington.

GENATOSAN, LTD., Loughborough, Leics.
Laboratory : As above.
Subject of Research : Medicinal, biological and fine chemicals.
Research Director : G. M. Dyson, M.A., Ph.D., F.R.I.C., M.I.Chem.E.
Number of Qualified Staff : 30.
Floor Space : 35,000 sq. ft. *Annual Expenditure* : £40,000.

GENERAL AIRCRAFT, LTD., London Air Park, Feltham, Middlesex.
Laboratory : As above.
Subject of Research : Aerodynamics ; aircraft structures ; materials. Wind tunnel—4 ft. × 4 ft. working section ; Structural Test Frame, 60 ft. × 16 ft. × 16 ft. × 40 tons. Tensile ; Brinell ; micrography ; magnetic crack detection.
Research Director : Charles W. Prower, B.Sc.Eng., A.F.R.Ae.S.
Number of Qualified Staff : 3.
Floor Space : 5,000 sq. ft. *Annual Expenditure* £10,000.

GENERAL CHEMICAL AND PHARMACEUTICAL CO., LTD., THE, Judex Works, Sudbury, Wembley, Middlesex.
Laboratory : As above.
Subject of Research : Analytical reagents, indicators, etc. Improvements in products and production methods.
Chief Chemist : R. C. Fawcett, Ph.D., M.Sc., A.R.I.C.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.
Laboratory : North Wembley, Middlesex.
Subject of Research : Physics, chemistry, metallurgy, and engineering (electrical, mechanical and illumination). Research and development associated with the electrical industry.
Research Director : Sir Clifford Paterson, O.B.E., D.Sc., F.R.S., M.I.C.E., M.I.E.E., F.Inst.P., etc.
Number of Qualified Staff : 250. *Floor Space* : 150,000 sq. ft.
Publications : Various papers.

GENERAL REFRACTORIES, LTD., Genefax House, Sheffield.
Laboratories : Worktop and Deepcar.
Research Director : H. M. Glass, M.Sc., Ph.D., F.R.I.C.
Technical Managers : B. Eichler (Acid Refractories) ; H. Parnham (Basic Refractories).
Number of Qualified Staff : 3.

GLACIER METAL CO., LTD., 368, Ealing Road, Alperton, Wembley, Middlesex.
Laboratory : As above.
Subject of Research : Improvement of bearing materials ; development of improved methods for making all types of bearings, bushes and thrust washers.
Research Director : W. H. Tait.
Number of Qualified Staff : 7. *Floor Space* : 3,000 sq. ft.

GLAXO LABORATORIES, LTD., Greenford, Middlesex.
Laboratories : Greenford, Middlesex ; and Barnard Castle, County Durham.
Subject of Research : Pharmaceutical and nutritional products ; preparations of biological origin, including antibiotics.
Research Director : T. F. Macrae, O.B.E., D.Sc., Ph.D., B.Sc.
Number of Qualified Staff : 46.
Publications : Papers, during 1946, in *Analyst*, *Biochem. J.*, *Brit. J. Pharm.*, *B.M.J.*, *Food Manufacture*, *J. Path. & Bact.*, *J. Pharmacol. & Exper. Ther.*, *J. Soc. Chem. Ind.*, *Nursing Mirror*, *Procs. Nutrition Soc.*, *Q.J. Pharm.*, and a paper read at the Ministry of Fuel and Power Conference.

GLOSTER AIRCRAFT CO., LTD., THE, Hucclecote, Gloucester.

Laboratory : As above.

Subject of Research : Aeronautical engineering.

Research Director : J. S. Louch.

Floor Space : 6,000 sq. ft.

Annual Expenditure : £10,000.

Publications : Internal memoranda only.

W. T. GLOVER & CO., LTD., Trafford Park, Manchester, 17.

Laboratory : As above.

Subject of Research : Electric cables and materials used therein, including all types of gaseous liquid and solid dielectrics, manufacturing processes and plant, sheathing or protective materials, cable accessories ; testing and proving methods, etc.

Research Director : Committee.

Number of Qualified Staff : 4.

Floor Space : 1,300 sq. ft. of Laboratory floor space ; 30,000 sq. ft. of open test ground.

Annual Expenditure : £5,000.

Publications : Papers in *Electrical Review* and *J. Inst. Electrical Engineers*.

GOUROCK ROPEWORK CO., LTD., THE, 92, Bay Street, Port Glasgow.

Laboratory : As above.

Subject of Research : Problems in spinning and weaving of all fibres for cordage and canvas, and the processing and proofing thereof.

Research Director : Vacant.

Number of Qualified Staff : 4.

Floor Space : 3,600 sq. ft.

Publications : Papers in *J. Textile Inst.*

HADFIELDS LTD., East Hecla Works, Tinsley, Sheffield, 9.

Laboratory : As above.

Subject of Research : General metallurgical research, mainly ferrous. Fundamental developments of new alloys of specific properties ; improvements in production processes and in quality of products ; development of efficient plant design.

Research Director : W. J. Dawson, Assoc.Met. of Sheffield University.

Number of Qualified Staff : 16.

Floor Space : 20,000 sq. ft.

Publications : Reports submitted to Iron and Steel Institute.

HATHERNWARE, LTD., Hathern Station Works, nr. Loughborough, Leics.

Laboratory : As above.

Subject of Research : Ceramic research—acid-proof chemical stoneware, porcelain, cements, etc., engineering bricks.

Research Director : G. S. Shipley (Hons. Pottery, Stoke-on-Trent).

HAWKER AIRCRAFT, LTD., Canbury Park Road, Kingston-on-Thames.

Laboratory : As above.

Subject of Research : All branches of the science of aeronautics in connection with the development of high speed aircraft.

Chief Designer : S. Camm, C.B.E., F.R.Ae.S.

Number of Qualified Staff : 21.

HAYWARD-TYLER & CO., LTD., Crawley Green Road, Luton, Beds.

Laboratory : As above.

Subject of Research : Cavitation, bearings, wear, etc. ; model testing ; measurement of stresses in pumping machinery and detailed investigation of the performance of pumps and mineral water machinery.

Research Directors : A. Ivanoff, Ph.D.(Eng.), M.Sc.(Eng.) ; and G. P. E. Howard, B.A. (Cantab.).

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., 51-53, Hatton Garden, London, E.C.1.

Research Department : Gravesend Works, Gravesend, Kent. (Physical, chemical, metallurgical, electrical, photographic, rubber technology, plastics technology laboratories).

Subject of Research : Paper cables ; rubber, plastic and other insulated wires ; distribution equipment, including joints and fuse equipment. Development of cables wires and equipment for such special conditions as high voltage and high frequency.

Research Manager : W. C. Barry, B.Sc.(Eng.), M.I.E.E., F.Inst.P.

Number of Qualified Staff : 24.

Awards : Post-graduate university courses for selected investigators at the Company's expense.

Publications : Company's journal *Distribution of Electricity*, and contributions to the usual scientific and technical journals.

HENLEY'S TYRE & RUBBER CO., LTD., Milton Court, Westcott, Dorking, Surrey.

Laboratory : Crete Hall Road, Gravesend, Kent.

Subject of Research : Investigation of rubber materials and ingredients, fabrics and other raw materials used in the tyre industry. Development of rubber compounds. Developments of manufacturing processes, general research, etc., relating to design and construction of pneumatic tyres and other rubber products.

Head of Works Technical Departments : E. R. Thornley, B.Sc.

Number of Qualified Staff : 5.

Floor Space : 3,600 sq. ft.

HIGH DUTY ALLOYS, LTD., Buckingham Avenue, Slough, Bucks.

Laboratory : As above.

Subject of Research : Production and fabrication of aluminium and magnesium alloys ; research facilities provided for alloy development, corrosion and protection and finishing, mechanical testing, x-ray crystallography, damping, analytical chemistry, metallurgy and radiography.

Research Director : R. Jones, M.Sc.

Publications : Papers in *J. Inst. Metals*, *Procs. Inst. Mech. Engineers*, *Metallurgia*, *Metal Industry*, *Foundry Trade Journal*.

Information Officer : L. L. Edwards.

HIGHWAYS CONSTRUCTION, LTD., Iddesleigh House, Caxton Street, London, S.W.1.

Laboratory : Wandsworth, London, S.W.18.

Subject of Research : Research in connection with bituminous materials employed in road and building construction.

Technical Section : G. Berry ; J. V. Murrell.

ADAM HILGER, LTD., 98, St. Pancras Way, London, N.W.1.

Laboratory : As above.

Subject of Research : Detection and measurement of radiation from the hard x-rays to the infra-red and the utilisation of the same for fundamental and applied research.

Technical Adviser : F. Twyman, F.Inst.P., F.R.S.

Controller of Research and Development : A. C. Menzies, M.A., D.Sc.

Number of Qualified Staff : 13.

Floor Space : 11,500 sq. ft.

Annual Expenditure : £10,000.

Publications : Papers in *The Analyst*, *J. Sci. Inst.*, *J. Soc. Chemical Industry*, *Machine Tool Review*, *Procs. Physical Soc.*, *Trans. Faraday Soc.*, *Trans. Optical Soc.*, etc.

Information Officer : T. L. Tippell.

HIVAC LIMITED, see AUTOMATIC TELEPHONE AND ELECTRIC CO., LTD.

HOLBROOKS, LTD., 203, Ashted Row, Birmingham, 7.

Laboratory : As above, and at Stourport Brewery.

Research Chemist : F. A. Oliver, B.Sc., A.R.I.C., A.C.T.C.(Birm.).

Floor Space : 1,125 sq. ft.

R. W. HOLDEN, LTD., Primrose Factory, Darwen, Lancs.*Laboratory* : As above.*Subject of Research* : Chemical and bacteriological analysis of foodstuffs, oils, fats, etc., in connection with food canning and manufacture.*Research Director* : E. W. Jackson, A.M.C.T.**HOLOPHANE, LTD.,** Elverton Street, London, S.W.1.*Laboratory* : As above.*Subject of Research* : Illumination, with particular reference to the design, manufacture and application of prismatic glassware.*Research Director* : S. English, D.Sc., M.I.E.E., F.Inst.P.*Number of Qualified Staff* : 2.*Publications* : Papers in *J. Soc. Glass Technology*, *Trans. Illuminating Engineering Soc.* and *Public Lighting*.**HOVIS, LTD.,** 154, Grosvenor Road, London, S.W.1.*Laboratory* : As above.*Subject of Research* : Problems arising from food manufacture and nutrition.*Research Director* : N. Palmer, A.C.G.F.C., F.R.I.C.*Number of Qualified Staff* : 2.**HENRY HUGHES & SON, LTD.,** Huson Works, New North Road, Barkingside, Ilford, Essex.*Laboratory* : As above.*Subject of Research* : Instruments for air and sea navigation, and industrial control and research.*Research Director* : D. O. Sproule, M.Sc.*Number of Qualified Staff* : 15.*Floor Space* : 8,500 sq. ft. *Annual Expenditure* : £35,000.*Publications* : *Hughes Tables* ; *Sea and Air Navigation*.*Information Officer* : Post temporarily vacant. Apply to Chief Scientist.**HYMATIC ENGINEERING CO., LTD.,** Glover Street, Redditch, Worcs.*Laboratory* : As above.*Subject of Research* : Work mainly related to air compressors of reciprocating piston type. Glandless control valves ; spraying and atomisation ; heat exchangers.*Research Director* : R. B. Elliott, B.Sc.(Hons.)Eng.*Number of Qualified Staff* : 2*, normally 5.*Floor Space* : 5,000 sq. ft. *Annual Expenditure* : £15,000.*Information Officer* : R. B. Elliott, B.Sc.(Hons.)Eng.**ILFORD, LTD.,** Roden Street, Ilford, Essex.*Laboratory* : As above.*Subject of Research* : Photographic materials and processes.*Research Director* : G. B. Harrison, O.B.E., Ph.D., F.Inst.P.*Number of Qualified Staff* : 50. *Floor Space* : 33,000 sq. ft.**IMPERIAL CHEMICAL INDUSTRIES, LTD.,** Nobel House, Buckingham Gate, London, S.W.1.*Research Laboratories* : Billingham, Co. Durham ; Blackley, Manchester ; Bracknell, Berks. ; Hyde, Cheshire ; Northwich, Cheshire ; Runcorn, Cheshire ; Slough, Bucks. ; Stevenston, Ayrshire ; Welwyn Garden City, Herts. ; Widnes, Lancs. ; Witton, Birmingham.*Subject of Research* : Fundamental and applied research covering the whole range of the Company's present and prospective products.*Research Director* : Sir Wallis Akers, C.B.E.*Research Controller* : R. M. Winter, M.Sc., F.R.I.C.*Division Research Directors and Research Managers* : J. P. Baxter, B.Sc., Ph.D., A.I.M.Chem.E. ; M. Cook, Ph.D., D.Sc. ; J. Ferguson, B.Sc., Ph.D., F.R.I.C. ; J. S. Gourley, B.Sc., Ph.D., F.R.I.C. ; R. Holroyd, M.Sc., Ph.D. ; N. P. Inglis, M.Eng., Ph.D., M.I.Mech.E. ; A. H. Lewis, B.Sc. ; C. Paine, B.Sc. ; T. R. Scott, B.A. ; F. P. Stowell, B.Sc., Ph.D., F.R.I.C. ; J. C. Swallow, B.Sc., Ph.D., A.M.I.Chem.E. ; J. Taylor, Ph.D., D.Sc., F.R.I.C. ; W. C. Wilson, B.A., B.Sc. ; A. G. White, D.Sc., A.R.I.C.

* The research department is not yet fully equipped or fully staffed.

Deputy, Associate, and Assistant Research Managers : B. W. Bradford, B.Sc., Ph.D., F.R.I.C. ; J. H. Brown, B.Sc. ; L. J. Burrage, D.Sc., Ph.D., F.R.I.C. ; C. Carter, B.Sc., M.A. ; L. M. Clark, M.A., Ph.D., A.R.I.C. ; C. Cockram, B.Sc., Ph.D. ; F. A. F. Crawford, B.A., A.R.I.C. ; A. A. Drummond, M.Sc., A.R.I.C. ; I. J. Faulkner, B.Sc., Ph.D. ; J. H. Gilfillan, B.Sc. ; L. A. Haddock, M.Sc., F.R.I.C. ; A. J. Hailwood, M.Sc. ; C. G. Harris, M.A.(Oxon.) ; R. Hill, B.Sc., Ph.D. ; D. W. Huebner, M.Sc., Ph.D. ; E. Hunter, B.Sc., Ph.D., F.R.I.C. ; E. Jones, M.Sc. ; H. R. Leech, M.Sc. ; F. W. Lynch, M.Sc., F.R.I.C. ; F. D. Miles, D.Sc., A.R.C.S., F.R.I.C. ; R. B. Mooney, M.A., B.Sc., Ph.D. ; H. A. Piggott, B.Sc., Ph.D., A.R.I.C. ; J. W. R. Rayner, M.A., B.Sc., F.R.I.C. ; A. M. Roberts, B.Sc., Ph.D., A.R.I.C. ; W. A. Sexton, B.Sc., Ph.D., A.R.I.C. ; S. S. Smith, M.Sc. ; E. J. Stephens, M.Eng., M.Inst.Chem.Eng. ; J. W. Tait, M.A., B.Sc., F.R.I.C. ; C. C. Tanner, B.Sc., Ph.D. ; A. W. Taylor, B.Sc., Ph.D., A.R.I.C. ; H. Taylor, M.Sc., Ph.D., A.R.I.C. ; W. Taylor, M.Sc., Ph.D. ; H. J. Thurlow, B.Sc., Ph.D., A.R.I.C. ; E. Whitworth, B.Sc. ; E. G. Williams, B.A., B.Sc. ; R. C. Woodward, M.A., Ph.D.

Floor Space : 900,000 sq. ft. *Annual Expenditure* : About £2,000,000.

Awards : I.C.I. has endowed research fellowships at some of the principal universities and scholarships at certain universities with which some of the constituent companies had special associations. Grants are made to research workers in universities to meet the cost of special chemicals and apparatus.

Publications : About 220 scientific papers per annum read before scientific societies or published in scientific journals.

Information Officer : J. E. Holmstrom, B.Sc.(Eng.), Ph.D.(Econ.), A.M.I.C.E.

INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS CO., LTD.,

THE, Herga House, Vincent Square, London, S.W.1.

Laboratory : Silvertown, London, E.16.

Subject of Research : Rubber, gutta percha, ebonite and synthetic materials.

Research Director : W. R. Row, F.I.R.I.

INTERNATIONAL ALLOYS, LTD., Bicester Road, Aylesbury, Bucks.

Laboratory : As above.

Subject of Research : Alloying and casting of light alloys ; refining of secondary light metals and related subjects.

Research Director : E. Scheuer, Dr.phil.nat.

Number of Qualified Staff : 3.

Publications : Papers in *The Analyst*, *J. Scientific Instruments*, *J. Soc. Chemical Industry*, *Light Metals*, *Metallurgia*.

INTERNATIONAL COMBUSTION, LTD., Nineteen, Woburn Place, London, W.C.1.

Laboratory : Derby.

Subject of Research : Combustion phenomena ; external fouling of steam boilers ; corrosion of high pressure boilers and feed lines ; determination of impurities in high purity steam ; particle size determination in the sub-sieve range ; commercial grinding and vacuum filtration ; welding.

Research Director : E. P. B. Wilson, B.Sc., F.R.I.C., M.I.Chem.E.

Floor Space : 4,000 sq. ft. *Annual Expenditure* : £45,000.

IOCO, LTD., Netherton Works, Glasgow, W.3.

Laboratory : As above.

Subject of Research : Use of newer synthetic rubbers and plastics as proofing agents for fabrics, including glass, rayons, etc. Insulating fabrics for tropical use. Sponge products from synthetic rubber for anti-vibration pads, etc. New applications for laminated boards (phenol-formaldehyde type), e.g., bearings, press dies.

Research Director : J. Kirkwood, A.I.R.I.

Number of Qualified Staff : 5.

Floor Space : 5,000 sq. ft. *Annual Expenditure* : £12,000-£14,000.

Publications : Papers in *Trans. Inst. Rubber Industry*.

WILLIAM JESSOP & SONS, LTD., Brightside Works, Sheffield, 1.

Laboratory : As above.

Subject of Research : Metallurgy, particularly of special steels, chemistry, permanent magnets, refractories, etc.

Research Director : As for B.S.A. Group Research Centre, *q.v.*

Number of Graduates : 12.

Floor Space : 6,000 sq. ft.

Annual Expenditure : £40,000.

Publications : Papers in *J. Iron and Steel Inst.*, *Iron and Steel*, *Metallurgia*, etc.

Information Officer : As for B.S.A. Group Research Centre, *q.v.*

JEYES' SANITARY COMPOUNDS CO., LTD., Millbrook, Manor Road Chigwell.

Laboratory : Richmond Street, Plaistow, London, E.13.

Subject of Research : Disinfectants, antiseptics and insecticides.

Chief Chemist : J. Gibson, F.R.I.C.

Floor Space : 1,800 sq. ft.

Annual Expenditure : £1,000.

Awards : £5,000 donation to Veterinary Educational Trust to be used at discretion of the latter.

JICWOOD, LTD., Weybridge, Surrey.

Laboratory : As above.

Subject of Research : Insulating and building materials and adhesives for wood and metal construction.

Research Director : F. C. Lynam, F.R.Ac.S.

Number of Qualified Staff : 3.

JAMES A. JOBLING & CO., LTD., Wear Glass Works, Sunderland.

Laboratory : As above.

Subject of Research : Melting, processing, and applications of glass ; development of new glasses and processes.

Research Manager : S. M. Cox, B.A., AInst.P..

Number of Qualified Staff : 3.

Floor Space : 3,600 sq. ft.

Publications : Contributions to *Chemistry and Industry* and *Nature*.

JOHNSON & JOHNSON (GT. BRITAIN), LTD., Trading Estate, Slough, Bucks.

Laboratory : Airebank Mill, Gargrave, Yorks.

Subject of Research : Surgical dressings and adhesive plasters.

Research Director : G. C. Burgess, B.Sc., A.R.I.C., Ph.C., M.P.S.

JOHNSON MATTHEY & CO., LTD., 73-83, Hatton Garden, London, E.C.1.

Laboratory : Exhibition Grounds, Wembley, Middlesex.

Subject of Research : Preparation, properties and uses of gold, silver, the platinum metals and the rarer metals, and the preparation of spectrographically standardised materials compounds.

Research Director : D. McDonald, B.Sc., F.R.I.C., F.I.M., M.I.Chem.E., F.I.I.A.

General Manager of Research Laboratories : A. R. Powell, F.I.M.

Number of Qualified Staff : 16.

Publications : Papers in *The Analyst*, *J. Inst. Electrical Engineers*, *J. Inst. Metals*, *J. Scientific Instruments*, *Metal Industry*, *Metal Treatment*.

RICHARD JOHNSON & NEPHEW, LTD., Bradford Iron Works, Forge Lane, Manchester, 11.

Laboratory : As above.

Subject of Research : All phases of production from billet or wire bar to wire, including rod rolling, heat treatment, galvanising and tinning. Also cold rolling, wiredrawing etc. of ferrous and non-ferrous wires.

Chief Metallurgist : C. F. Brereton, F.I.M.

Number of Qualified Staff : 4.

Floor Space : 3,500 sq. ft.

KAYSER, ELLISON & CO., LTD., Carlisle Works, Sheffield, 4.

Laboratory : Darnall Works, Sheffield, 9.

Subject of Research : Special high grade steels, including tool steels, high speed steels, free cutting steels, stainless steels, and heat-resisting valve steels.

Research Director : J. Pashley, Assoc. Met.

GEORGE KENT, LTD., 199, High Holborn, London, W.C.1.*Laboratory* : Biscot Road, Luton.*Subject of Research* : Industrial instruments for the measurement of temperature, pressure, flow, electrical and electro-chemical quantities.*Research Director* : R. S. Medlock, B.Sc., A.R.I.C., A.M.I.E.E.*Number of Qualified Staff* : 5.*Floor Space* : 4,500 sq. ft.*Annual Expenditure* : £7,500.*Information Officer* : G. P. L. Williams, B.Sc.**A. KERSHAW & SONS, LTD.,** Mortimer House, Mortimer Street, London, W.1.*Laboratory* : Harehills Lane, Leeds, 8.*Subject of Research* : Visual binocular instruments ; projection apparatus ; cinematograph installations ; photographic cameras ; chemical and physical laboratory appliances ; high vacuum technique.*Research Director* : N. Kershaw.*Floor Space* : 4,000 sq. ft.*Annual Expenditure* : £15,000.**KIRKSTALL FORGE, LTD.,** Kirkstall, Leeds, 5.*Laboratory* : As above.*Subject of Research* : Iron and steel ; ferrous metallurgy and engineering.*Research Director* : E. Simister, Ph.D., B.Sc.*Number of Qualified Staff* : 4.*Floor Space* : 5,000 sq. ft.**K. & L. STEELFOUNDERS AND ENGINEERS, LTD.,** Coborn Works, Letchworth, Herts.*Laboratory* : As above.*Subject of Research* : Metallurgical research—esp. steelmaking and steelfoundry problems.*Chief Metallurgist* : H. Elliss, Ph.D., B.Met., F.I.M.*Number of Qualified Staff* : 3.*Floor Space* : 8,500 sq. ft.*Publications* : Confidential reports, etc.*Information Officer* : M. W. Eagleton.**KODAK, LTD.,** Kingsway, London, W.C.2.*Laboratory* : The Works, Wealdstone, Harrow, Middlesex.*Subject of Research* : Photographic materials, apparatus and processes.*Research Director* : E. R. Davies, O.B.E., B.Sc., F.Inst.P., F.R.P.S.*Number of Qualified Staff* : 60.*Floor Space* : 32,000 sq. ft.*Publications* : Abridged Scientific Publications annually.*Research Librarian and Information Officer* : Dr. R. S. Schultz.**LANGLEY ALLOYS, LTD.,** Langley, Slough, Bucks.*Laboratory* : As above.*Subject of Research* : Development of precipitation-hardening copper-base alloys, particularly of high electrical conductivity ; development of corrosion-resisting nickel-base and copper-base alloys.*Chief Metallurgist* : W. H. Richardson, B.Sc.*Floor Space* : 1,000 sq. ft.*Annual Expenditure* : £7,000.**B. LAPORTE, LTD.,** Luton, Beds.*Laboratory* : As above.*Subject of Research* : Chemistry of hydrogen peroxide, peroxy compounds, organic and inorganic, barium compounds and many related compounds ; scientific study of detergents and peroxide bleaching.*Chief Chemist* : V. W. Slater, B.Sc., F.R.I.C., M.I.Chem.E.*Floor Space* : 11,000 sq. ft.**LEVER BROS. & UNILEVER, LTD.,** Unilever House, Blackfriars, London, E.C.4.*Laboratory* : Port Sunlight, Ltd., Cheshire.*Subject of Research* : Soap and toilet preparations ; foods ; oil milling ; animal nutrition.*Research Manager* : R. Thomas, D.Sc., F.R.I.C.*Floor Space* : 68,400 sq. ft.*Publications* : Papers in *The Analyst*, *Biochem. J.* and *J. Chem. Soc.*

LIMMER & TRINIDAD LAKE ASPHALT CO., LTD., THE, Steel House, Tothill Street, London, S.W.1.

Laboratory : Trinidad Wharf, Carnwath Road, London, S.W.6.

Subject of Research : Bitumens, asphalts and other plastic compositions for roads and buildings ; special bituminous compounds for Ministry of Aircraft Production, Admiralty, etc.

Research Director : D. C. Broome, A.Inst.P., F.C.S., F.Inst.Pet.

Number of Qualified Staff : 3.

Floor Space : 5,000 sq. ft.

Publications : Papers in the technical press.

LIVERPOOL BORAX CO. LTD., THE (incorporating FEEDWATER SPECIALISTS CO. and ANDREW MAXWELL), Maxwell House, St. Paul's Square, Liverpool, 3.

Laboratory : As above.

Subject of Research : Development of alginates, i.e., seaweed extracts ; industrial water problems, including reagents for dealing with same ; water softening plants ; anti-rust preparations ; detergents for a variety of industries ; roofing materials ; boron products for agriculture ; metallurgical research.

Research Directors : J. S. Merry, F.R.I.C., F.C.S. ; G. S. Irving, M.I.Chem.E. ; W. Murray, A.M.C.T., F.R.I.C., F.C.S., M.Inst.F., and W. F. Gerrard, A.R.I.C., F.C.S., M.Inst.F.

Floor Space : 500 sq. ft.

Annual Expenditure : £2,000.

Information Officer : H. W. Bannister.

LONDON BRICK CO., LTD., Africa House, Kingsway, London, W.C.2.

Laboratory : Stewartby, Bedfordshire.

Subject of Research : Mainly though not entirely in the field of ceramics. Scope : long range problems directed towards the development of new products and new and improved processes ; also short term investigations connected with day to day manufacture.

Research Director : T. G. W. Boxall, A.C.G.I., B.Sc., A.M.I.C.E.

Number of Qualified Staff : 5.

Floor Space : 3,000 sq. ft. Laboratory Building + 1,000 sq. yds. Materials Testing Ground.

LONDON MIDLAND AND SCOTTISH RAILWAY CO., L.M.S. Headquarters, Watford, Herts.

Laboratory : London Road, Derby. (Smaller chemical laboratories at Crewe, Derby, Glasgow, Horwich and Stonebridge Park (London)).

Subject of Research : Chemical engineering, metallurgical and physical research on railway engineering and transportation problems. Separate sections cover the chemical and physical work involved in paint and textile technology.

Manager, Scientific Research Department : T. M. Herbert, M.A., M.I.Mech.E.

Number of Qualified Staff : 65.

Floor Space : 25,000 sq. ft. (of which 13,000 sq. ft. are in respect of the main research laboratory at Derby).

Awards : Herbert Jackson Medal awarded annually for the best report prepared by a member of the staff.

Publications : Various papers to Institutions and contributions to the scientific and technical press.

Information Officer : Miss H. F. Parkinson, B.A.

LOTUS, LTD., Stafford.

Laboratory : As above.

Subject of Research : Leather, plastics, textiles, adhesives and other products used in the manufacture of footwear.

Research Director : F. G. Mercer.

Number of Qualified Staff : 2.

Floor Space : 1,000 sq. ft.

Annual Expenditure : £750.

LOW & BONAR, LTD., and Associated Companies, Dundee, Angus, Scotland.
Laboratories : At Baxter Bros. & Co., Ltd., Dundee ; enlarged in 1947 to three times their former size.

Subject of Research : Spinning, weaving, dyeing, bleaching and proofing of flax, hemp, jute and cotton for heavy or mechanical fabrics, canvases, tarpaulins, ducks, etc.

Technical Director : H. L. Parsons, B.Sc., F.R.I.C., F.T.I.

J. LYONS & CO., LTD., Cadby Hall, London, W.14.

Laboratory : 149, Hammersmith Road, London, W.14.

Subject of Research : Composition, processing, manufacture and distribution of food.

Research Director : L. H. Lampitt, D.Sc., F.R.I.C., M.I.Chem.E.

Number of Qualified Staff : 135. *Floor Space* : 35,000 sq. ft.

Publications : Papers in scientific and technical journals.

Information Officer : C. A. Bassett, B.Sc., F.R.I.C.

JOHN LYSAGHT, LTD., Orb Iron Works, Newport, Mon.

Laboratory : As above.

Subject of Research : Ferromagnetism (dynamo, motor, and transformer sheets) ; plastic deformation (auto-body deep-drawing sheets) ; and other subjects relevant to the production of high-grade steel sheet material.

Consultant on Research and Development : G. C. Richer.

Awards : Research training schemes provide for university scholarships (with residential allowances), and, where merited, for post-graduate experience in external research laboratories of university status, both at home and abroad.

Publications : Papers in *J. Iron and Steel Inst.* and *Metallurgia*.

EDWARD MACBEAN & CO., LTD., Wellington Mills, Port Dundas, Glasgow, C.4.

Laboratory : As above.

Subject of Research : Development work on synthetic resins and oil varnish by coatings or other applications to textile fibres.

MACONOCHE BROS., LTD., 140/2, Great Portland Street, London, W.1.

Laboratories : Headquarters : 140/2, Great Portland Street, London, W.1.

Factories : Hadfield, Manchester ; Fraserburgh, Aberdeenshire.

Subject of Research : Food manufacturing problems—nutritive value of foods, processing losses, etc.

Research Director : J. P. Allchin, F.R.I.C.

Awards : Bursaries for overseas studies.

MAGNESIUM ELEKTRON, LTD., Abbey House, Baker Street, London, N.W.1.

Laboratory : Clifton Junction, Nr. Manchester.

Subject of Research : *Chemical Research Dept.* : production of magnesium and its alloying compounds from their raw materials. *Metallurgical Research Dept.* : investigations of standard alloys and development of new alloys, including melting and casting, fabrication of wrought products, welding and sheet fabrication, corrosion and corrosion protection, mechanical testing, design aspects and fabrication of prototype structure.

Research Director : Major C. J. P. Ball, D.S.O., M.C., F.R.Ae.S.

Chief Chemist : S. J. Fletcher, B.Sc., Ph.D.

Chief Metallurgist : F. A. Fox, M.Sc.

Floor Space : *Chemical Research* : Labs. and offices, 17,000 sq. ft. *Metallurgical Research* : Labs. and offices, 9,000 sq. ft.

Annual Expenditure : £60,000.

Publications : House Journal—*Magnesium Review and Abstracts* (quarterly) and many publications in *Engineering*, *Foundry Trade J.*, *J. Inst. Metals*, *J. Soc. Chem. Industry*, *Metal Industry*, *Metallurgia*.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, New Street, Chelmsford.*Laboratory* : Gt. Baddow and Chelmsford, Essex.*Subject of Research* : Radio telecommunication, radio navigation, electronics and ionosphere.*Research Director* : J. G. Robb, M.I.E.E., F.Inst.P., F.Inst.E.*Publications* : *Marconi Review* (quarterly).**MATHER & PLATT, LTD.,** Park Works, Newton Heath, Manchester, 10.*Laboratory* : As above.*Subject of Research* : Textile finishing machinery, centrifugal pumps, electrical machinery, general engineering and fire engineering, food machinery.*Research Director* : S. F. Barclay, D.Sc., Ph.D., M.Inst.C.E.*Number of Qualified Staff* : 8.**MAY & BAKER, LTD.,** Rainham Road, Dagenham, Essex.*Laboratory* : As above.*Subject of Research* : Chemotherapy in relation to human and veterinary diseases at home and abroad; research on plastic films. As a member Company of the Therapeutic Research Corporation, *q.v.*, we support academic research in various universities and similar institutes.*Research Director* : A. J. Ewins, D.Sc., F.R.S.*Number of Qualified Staff* : 40-50.*Awards* : Two research fellowships in the Liverpool School of Tropical Medicine to assist in carrying out fundamental research problems in the field of tropical medicine.*Publications* : Papers in *Annals of Tropical Medicine and Parasitology*, *Biochem. J.*, *Brit. J. Experimental Pathology*, *J. Chem. Soc.*, *J. American Chem. Soc.*, *Nature*, *Pharmaceutical J.*, *Procs. Royal Soc. Medicine*, *Quarterly J. Pharmacy and Pharmacology*, *Trans. Royal Soc. Tropical Medicine and Hygiene*.**METAL BOX CO., LTD.,** The Langham, Portland Place, London, W.1.*Laboratory* : Research Department, The Metal Box Co., Ltd., Acton, London, W.3.*Subject of Research* : Materials and methods used in the fabrication of metal and paper containers.*Head of Research Division* : R. K. Sanders, M.A. (Oxon).*Number of Qualified Staff* : 21.*Floor Space* : 10,000 sq. ft.*Information Officer* : R. Taggart.**METROPOLITAN-VICKERS ELECTRICAL CO., LTD.,** 1, Kingsway, London, W.C.2.*Laboratory* : Trafford Park, Manchester, 17.*Subject of Research* : Electricity and magnetism, high voltage engineering, metallurgy and physical metallurgy, mechanical testing and dynamics, acoustics, radio, chemistry, physical chemistry, vacuum physics and the properties of dielectrics and engineering materials in general.*Research Director* : Sir Arthur P. M. Fleming, C.B.E., D.Eng., M.Sc.(Tech.), F.C.G.I., M.I.E.E., M.I.Mech.E., F.Inst.P.*Manager of Research* : B. G. Churcher, M.Sc., M.I.E.E.*Number of Qualified Staff* : 140.*Floor Space* : 136,000 sq. ft.*Awards* : Financial awards to selected members of the staff and trainees for full-time external post-graduate academic research in this country and abroad.*Publications* : Papers in *Brit. J. Radiology*, *Engineering*, *J. Inst. Electrical Engineers*, *J. Inst. Metals*, *J. Scientific Instruments*, *Philosophical Mag.*, *Procs. Physical Soc.*, *Procs. Royal Soc.*, *Trans. Faraday Soc.*, *Wireless Engineer*.*Information Officer* : J. S. P. Paton, B.Sc., A.R.T.C., A.M.I.E.E.**MILES AIRCRAFT, LTD.,** Aerodrome, Reading.*Laboratories* : Main Factory, Woodley and Land's End, Twyford, Berks.*Subject of Research* : Aeronautical and allied subjects.*Technical Director* : G. H. Miles, M.S.A.E.*Number of Qualified Staff* : 6.*Floor Space* : 10,000 sq. ft.*Annual Expenditure* : £20,000.*Publications* : Reports confined to firm.*Information Officer* : J. J. White.

JAMES MILLS, LTD., EXORS. OF, Bredbury Steel Works, Woodley, nr. Stockport, Cheshire.*Laboratory* : As above.*Subject of Research* : Steel re-rolling, cold working, machining, corrosion resistance, frictional wear, etc.*Research Director* : W. B. Wragge, B.Sc.Tech., A.I.C.*Number of Qualified Staff* : 5. *Floor Space* : 1,700 sq. ft.*Publications* : Papers in *J. Inst. Production Engineers, Metallurgia*, etc.**MOND NICKEL CO., LTD., Grosvenor House, Park Lane, London, W.1.***Laboratories* : Birmingham : Acton, London ; etc. (see below).*Subject of Research* : At Birmingham : long range and *ad hoc* metallurgical research with special reference to the production, properties and uses of ferrous and non-ferrous alloys containing nickel. At Acton : precious metals research. Other laboratories deal with process research on nickel and nickel containing non-ferrous alloys, carbonyl iron-powder, nickel and cobalt oxides and salts.*Manager, Development and Research Department* : L. B. Pfeil, O.B.E., D.Sc., A.R.S.M., F.I.M., to whom inquiries should be addressed at London.**MONKHOUSE & GLASSCOCK, LTD., Snowfields, London, S.E.1.***Laboratory* : As above (established April 1946).*Subject of Research* : Foodstuffs.*Director of Research* : R. J. L. Allen, Ph.D., M.Sc., F.R.I.C.*Number of Qualified Staff* : 2. *Floor Space* : 800 sq. ft.**MORGAN CRUCIBLE CO., LTD., Battersea Church Road, London, S.W.11.***Laboratory* : As above.*Subject of Research* : Plumbago crucibles ; refractories ; brushes for electrical machinery ; bearings ; battery and lighting carbons ; radio accessories ; structural carbon products ; carbon specialties ; graphite lubricants and compositions and allied products.**MORTON SUNDOWN FABRICS, LTD., Dentonhill, Carlisle.***Laboratory* : Standfast Dyers & Printers Ltd., Lancs.*Subject of Research* : Processing of textile materials.*Research Director* : W. Kilby, B.Sc.(Tech.), A.M.C.T.**MULLARD WIRELESS SERVICE COMPANY, LTD.***See entry at end of Section.***MURPHY RADIO, LTD., Broadwater Road, Welwyn Garden City.***Laboratory* : Bridge Road, Welwyn Garden City.*Subject of Research* : Design and development of domestic radio and television receivers, and all problems relating thereto.*Research Director* : G. Bernard-Baker, B.A.(Oxon), B.Sc.(Oxon), A.M.I.E.E.*Number of Qualified Staff* : 10.*Floor Space* : 10,000 sq. ft. *Annual Expenditure* : £30,000.**NATIONAL ADHESIVES, LTD., Slough, Bucks.***Laboratory* : As above.*Subject of Research* : Adhesives, starches, dextrans, synthetic resin adhesives, etc.*Research Director* : R. M. L. Francis, M.A.(Cantab).*Chief Chemist* : W. J. Opie, B.Sc.*Publications* : In America.**NATIONAL BENZOLE ASSOCIATION, THE, Wellington House, Buckingham Gate, London, S.W.1.***Laboratory* : 121, Scrubs Lane, Willesden, London, N.W.10.*Subject of Research* : Production, refining and uses of benzole and its constituents.*Chief Chemist* : W. H. Hoffert, M.A., B.Sc., F.R.I.C.*Research Chemist* : G. Claxton, M.Sc.*Number of Qualified Staff* : 7.*Floor Space* : 4,000 sq. ft. *Annual Expenditure* : £8,000-£10,000.*Publications* : *Motor Benzole: its Production and Use*, 2nd edition, 1938. *Standard Specifications for Benzole and Allied Products*, 2nd edition, 1938.

NEUCHATEL ASPHALTE CO., LTD., THE, 58, Victoria Street, London, S.W.1.*Laboratory* : Nacovia Wharf, Townmead Road, Fulham, London, S.W.6.*Subject of Research* : Production and application of road and building asphalts.*Floor Space* : 2,000 sq. ft.**NEWFORGE, LTD.**, Malone, Belfast.*Laboratory* : As above.*Subject of Research* : Food preservation, esp. freezing and canning.*Research Director* : R. J. Munro, B.Sc.(Glas.), A.R.T.C., F.R.I.C.*Number of Qualified Staff* : 4.*Floor Space* : 3,600 sq. ft.*Annual Expenditure* : £3,500.*N.B.* In addition to above there are analytical and bacteriological control laboratories with floor space of 2,000 sq. ft. and annual expenditure of £2,000.**NEW METALS & CHEMICALS, LTD.**, 4, Broad Street Place, London, E.C.2.*Subject of Research* : Developing and extending applications for the rarer metals and their compounds. Specialists in the supply of these materials for industrial and research purposes.*Research Director* : R. C. Williams.**NEWTON, CHAMBERS & CO., LTD.**, Thorndcliffe, nr. Sheffield.*Laboratory* : As above.*Subject of Research* : Development of : (a) disinfectants, insecticides, soap, cutting oils, tar products ; (b) chemical engineering, gasworks plant, constructional work, excavators, "plastic" tank-linings.*Research Director* : A. H. Dodd, M.A., F.R.I.C.*Number of Qualified Staff* : 20.*Awards* : Award to Members of R.I.C. on "Industrial Welfare" ; award to Members of I.A.S.(R.S.S.) on "Statistics in Industry". Sundry other Scholarships.*Publications* : Articles in *Analyst*, *Gas J.* and *J. Soc. Chem. Ind.***OVALTINE RESEARCH LABORATORIES**, see **A. WANDER, LTD.****OXO, LTD.**, Queen Street, London, E.C.4.*Laboratory* : 16, Southwark Bridge Road, London, S.E.1.*Subject of Research* : Concentrated foods, endocrine, hormones, amino acids, vitamins, organo-therapy, etc.*Research Director* : H. G. Rees, Ph.D., D.I.C., F.R.I.C.**C. A. PARSONS & CO., LTD.**, Heaton Works, Newcastle-upon-Tyne, 6.*Chief Research Engineer* : Dr. A. T. Bowden, B.Sc.(Eng.), Ph.D., M.I.Mech.E., M.I.Mar.E.*Number of Qualified Research Staff* : 32.**1. Electrical Research and High Voltage Laboratories :***Subject of Research* : Alternators, transformers, electronics.*Chief Electrical Research Engineer* : C. G. Giles, A.C.G.I., A.M.I.E.E.*Floor Space* : 3,600 sq. ft.**2. Mechanical Research :***Subject of Research* : Steam turbines, compressors, condensers.*Chief Mechanical Research Engineer* : J. L. Jefferson, B.A., A.M.I.Mech.E.*Floor Space* : 7,340 sq. ft.**3. Gas Turbine Research :***Subject of Research* : Compressors, combustion, heat exchange.*Gas Turbine Research Engineer* : R. G. Voysey, B.Sc. (Whit.Sch.).*Floor Space* : 4,000 sq. ft.**4. Metallurgical Research :***Subject of Research* : Heat-resisting materials.*Research Metallurgist* : Dr. J. H. Robertson, D.Sc.*Floor Space* : 2,400 sq. ft. (under construction).**5. Physics Research :***Subject of Research* : Glass reflectors, heat transfer.*Research Physicist* : E. R. Elliott, B.Sc., A.Inst.P.*Floor Space* : 1,500 sq. ft.**6. Applied Physics Research :***Subject of Research* : Heat exchange.*Applied Physics Research Engineer* : C. E. Iliffe, B.A.*Floor Space* : 1,000 sq. ft.

PHILIPS LAMPS, LTD., Century House, Shaftesbury Avenue, London, W.C.2.
Lamp Research and Development Laboratory : 1, Shrewsbury Road, London, N.W.10.
Welding Laboratory : 122, Brixton Hill, London, S.W.2.

Material Research Laboratories : New Road, Mitcham Junction, Surrey ; Cross Oak Lane, Salfords, nr. Redhill, Surrey.

Subject of Research : Electric lamps ; discharge lamps and gear ; arc welding electrodes ; radio components ; permanent magnet alloys ; ceramic materials ; glass ; refractory metals ; luminescent materials ; electron emission ; gas sorption.

Head of Material Research and Development Laboratories : J. A. M. van Moll, M.I.Chem.E., New Road, Mitcham Junction, Surrey.

Heads of Departments : T. Holmes, M.Sc., Ph.D. ; V. J. D. Hill, B.Met., Ph.D. ; G. I. Sutherland, A.R.C.S., D.I.C., Ph.D. ; M. L. Smith, D.I.C., Ph.D., F.R.I.C.

Number of Qualified Staff : 68.

Floor Space : 35,000 sq. ft.

Television and Receiver Laboratory : New Road, Mitcham Junction, Surrey.

X-ray Laboratory : 45, Nightingale Lane, London, S.W.12.

H. F. Heating Laboratory : 45, Nightingale Lane, London, S.W.12.

Sonic Laboratory : 45, Nightingale Lane, London, S.W.12.

Industrial Development Laboratory : 122, Brixton Hill, London, S.W.2.

Subject of Research : Broadcast and television receivers ; public address amplifiers ; microphones ; loudspeakers ; industrial and medical x-ray equipment ; electro-medical apparatus ; electrical welding equipment ; high frequency generators ; radio components.

Heads of Departments : H. G. Taylor, D.Sc.(Eng.), D.I.C., M.I.E.E., F.Inst.P. ; A. Nemet, Dr. Ing., A.M.I.E.E. ; K. A. Zandstra, A.M.I.E.E. ; C. L. Richards, B.Sc., A.C.G.I., A.M.I.E.E. ; L. F. Odell, O.B.E.

Number of Qualified Staff : 16.

Floor Space : 30,000 sq. ft.

ALEX. PIRIE & SONS, LTD., *see* WIGGINS, TEAPE & CO. (1919), LTD.

PORRITTS & SPENCER, LTD., Mossfield, Bury, Lancs.

Laboratory : Bamford, nr. Rochdale, Lancs.

Subject of Research : Research and development on fibres and their processing in relation to mechanical fabrics.

Research Director : W. S. Shaw, D.Sc., Ph.D., F.I.C.

Number of Qualified Staff : 4.

Floor Space : 5,000 sq. ft.

POWER-GAS CORPORATION, LTD., THE, Parkfield Works, Stockton-on-Tees.

Laboratory : As above.

Subject of Research : Production and treatment of industrial gases, treatment of edible oils, high duty cast iron, and Class 1 welded pressure vessels.

Research Directors : A. T. Grisenthwaite, B.Sc., F.R.I.C., M.I.Chem.E., and G. Milner, B.Sc., Ph.D., A.R.I.C., Assoc.M.Inst.Gas.Eng.

Floor Space : 4,500 sq. ft.

Annual Expenditure : £10,000.

PRESSED STEEL CO., LTD., Cowley, Oxford.

1. *Laboratory* : Metallurgical and Chemical.

Subject of Research : Development of materials and processes concerned in the large scale manufacture of motor car bodies and refrigerators.

Chief Metallurgist : G. Murray, M.Sc.

Floor Space : 9,000 sq. ft.

Number of Qualified Staff : 5.

Publications : Papers in *J. Inst. Metals*, *Sheet Metal Industries*, *Welding J.*

2. *Laboratory* : Refrigeration Research and Development.

Subject of Research : Development of domestic, commercial and industrial refrigeration plant and ancillary equipment. Heat exchange apparatus. Low temperature equipment, air conditioning apparatus and all forms of temperature and humidity control.

Floor Space : 3,500 sq. ft.

Number of Qualified Engineers : 5.

PRIESTMAN BROS., LTD., Holderness Foundry, Hull.*Laboratory* : As above.*Subject of Research* : Grabs, excavators and dredging cranes.*Research Director* : S. H. Priestman.*Floor Space* : 1,200 sq. ft. *Annual Expenditure* : £3,000-£3,500.*Publications* : Reports for internal use.**P.R.T. LABORATORIES, LTD.,** Cressex, High Wycombe, Bucks.*Subject of Research* : Communication transmitters and receivers ; high power R.F. transmitters and R.F. heaters ; industrial control equipment ; television ; acoustics, microwaves ; thermionics ; electrical measurements and measuring equipment ; electro-mechanical mechanisms ; electrical network problems and advanced circuit theory.*Number of Qualified Staff* : 40.*Information Officer* : T. Howard.**PYE, LTD.,** Radio Works, Cambridge.*Laboratory* : As above.*Subject of Research* : Radio receivers ; television receivers and transmitters ; telecommunications—fixed or mobile stations, and civil aviation ; cathode ray tubes ; thermionic valves ; public address equipment.*Research Director* : C. A. W. Harmer, O.B.E.**RADIATION, LTD.,** Radiation House, Thimble Mill Lane, Aston, Birmingham, 6.*Laboratory* : As above.*Subject of Research* : Problems concerning the principles of operation and development of all classes of gas and solid fuel appliances.*Technical Director* : H. Hartley, D.Sc., M.Inst.Gas.E.*Research Manager* : A. R. Bennett, M.Sc., Assoc.M.Inst.Gas.E.*Number of Qualified Staff* : 24.*Floor Space* : 12,000 sq. ft. *Annual Expenditure* : Approx. £100,000.*Awards* : Radiation Fellowship, tenable in the Department of Chemical Technology, Imperial College of Science and Technology, South Kensington (University of London).*Publications* : In *Trans. Inst. Gas Engineers*, *Gas J.*, *Gas World*, *Gas Times*, *Nature*.**RESEARCH PRODUCTS, LTD.,** Pickett-Thomson Research Laboratory, Nan Clarks Lane, London, N.W.7.*Laboratory* : As above.*Subject of Research* : Bacteriological medical research, esp. on the common cold and influenza and the streptococcus group of bacteria.*Research Director* : D. Thomson, O.B.E., M.B., Ch.B., D.Ph.*Floor Space* : 2,500 sq. ft. *Annual Expenditure* : £2,000-£3,000.*Publications* : Annals and monographs of the Pickett-Thomson Research Laboratory. Publications suspended during war ; reports, etc. confidential to members, papers contributed to technical and scientific journals.**A. REYROLLE & CO., LTD.,** Hebburn-on-Tyne.*Laboratory* : Technical & Research Dept. and Electrical Technical and Chemical at Hebburn-on-Tyne.*Subject of Research* : Switchgear, protective gear, generators, motors, domestic equipment and other electrical apparatus, including the factors controlling their application in service ; insulation for the above.*Head of Technical and Research Department* : J. A. Harle, M.Sc., M.I.E.E.*Publications* : Papers in *Electrical Review* and papers read before local Students' Section of I.E.E.**RHEOSTATIC CO., LTD., THE,** Farnham Road, Slough, Bucks.*Laboratory* : Athallan Grange, Frimley, Surrey.*Subject of Research* : Automatic temperature controls ; domestic heating.*Chairman* : L. Satchwell.*Joint Managing Directors* : T. N. Flight ; M. J. Gartside.

ROCHE PRODUCTS, LTD., Broadwater Road, Welwyn Garden City, Herts.*Laboratory* : As above.*Subject of Research* : New synthetic drugs, vitamins, antibacterials, biochemicals, synthesis of any substance of physiological interest.*Research Director* : F. Bergel, D.phil. nat., Ph.D., F.R.I.C., M.R.I.*Number of Qualified Staff* : 14.*Awards* : Several grants to universities, etc.*Publications* : Contributions to *J. Chem. Soc., Nature, Biochem. J., etc.***ROCKWARE GLASS SYNDICATE, LTD.,** Rockware Avenue, Greenford, Middlesex.*Laboratory* : As above.*Subject of Research* : Glass furnaces ; annealing and testing of glass ; strength, thermal endurance, chemical durability, and decolourising of glass ; enamelling ; quality control.*Research Director* : J. B. Murgatroyd, M.A., F.S.G.T.*Number of Qualified Staff* : 7.*Floor Space* : 5,300 sq. ft.*Publications* : Papers in *J. Soc. Glass Technology, Philosophical Magazine* and *Nature*.**ROWNTREE & CO., LTD.,** The Cocoa Works, York.*Laboratory* : As above.*Subject of Research* : Problems of products.*Research Director* : E. E. Wells, F.R.I.C.**SALFORD ELECTRICAL INSTRUMENTS, LTD.,** Silk Street, Salford, 3.*Laboratories* : Salford, Stockport, Warrington, Heywood, Brith.*Subject of Research* : Electrical, mechanical, optical, physical and radio apparatus, esp. those relating to exact and precise measurements.*Research Director* : G. R. Polgreen, B.Sc., M.I.E.E.*Publications* : Papers by research staff.**A. SANDERSON & SONS, see WALL PAPER MANUFACTURERS LTD., THE.****SANKEY RESEARCH LABORATORIES,** Albert Street, Bilston.*Laboratory* : Manor Works, Manor Road, Ettingshall, Wolverhampton.*Subject of Research* : Production, processing and properties of electrical sheet steel for transformers, machinery, etc.*Director of Research* : N. F. Astbury, M.A., F.Inst.P., A.M.I.E.E.*Number of Qualified Staff* : 7.*Floor Space* : 6,000 sq. ft.**SCOPHONY, LTD.,** 36, Victoria Street, London, S.W.1.*Laboratory* : Town Hall Buildings, Wells, Somerset.*Subject of Research* : Sound and picture communications ; television ; optical, electrical, mechanical and electronic instruments.*Director of Research* : Gustav Wikkenhauser, Diploma of the Budapest Technical University in Mechanical and Electrical Engineering.*Number of Qualified Staff* : 6.*Floor Space* : 30,000 sq. ft.*Annual Expenditure* : £10,000.*Publications* : Papers in *Electronic Engineering, J. Sci. Instruments* and *Photographic J. Information Officer* : P. L. F. Jones.**SCOTTISH CO-OPERATIVE WHOLESALE SOCIETY, LTD.,** 95, Morrison Street, Glasgow, C.5.**1. Cereal Laboratory** : Regent Mills, Glasgow, C.3.*Subject of Research* : Flour milling and allied problems.*Research Director* : J. Sword, M.A., B.Sc., Ph.D., F.R.I.C.*Floor Space* : 6,000 sq. ft.*Annual Expenditure* : £2,980.**2. Chemical Sundries Department** : 187, Bogmoor Road, Shieldhall, Glasgow, S.W.1.*Subject of Research* : All articles manufactured by the department.*Research Director* : G. H. Fraser.*Floor Space* : 3,840 sq. ft.

SHEFFIELD SMELTING CO., LTD., THE, Royds Mill Street, Sheffield, 4.

Laboratory : As above.

Subject of Research : Smelting and refining of precious and rare metals ; treatment of complex materials containing non-ferrous metals ; properties and use of the above metals for the purposes of the company's manufactures.

SHELL PETROLEUM CO., LTD., THE, Norman House, Strand, London, W.C.2.

Laboratory : Thornton Research Centre, P.O. Box 1, Chester.

Subject of Research : Research on the whole range of products of the petroleum industry, comprising engineering (especially engine testing of fuels and lubricants), chemistry, metallurgy, physics, etc.

Research Director : Brigadier R. A. Bagnold, O.B.E., F.R.S.

Number of Qualified Staff : Approximately 150. *Floor Space* : 100,000 sq. ft.

Publications : *J. Inst. Petroleum*, *Trans. Faraday Soc.*

Awards : Various kinds of university researches in several universities, e.g. Cambridge. Leeds, Bangor, are supported as circumstances arise.

SHERWOODS PAINTS, LTD., Jenkins Lane, Barking, Essex.

Laboratory : As above.

Subject of Research : Surface coatings as applied to wood, metal or cloth—including synthetic resins, oils, plastics, paint, varnish, distemper and cellulose products.

Research Director : D. L. Annand, B.Sc.

HENRY SIMON, LTD., Cheadle Heath, Stockport.

Laboratory (1) : Cereal laboratory.

Subject of Research : Flour milling and allied problems.

Research Director : J. W. Dinsdale.

Floor Space : 1,200 sq. ft.

Laboratory (2) : Physical and engineering laboratory.

Subject of Research : Problems relating to flour milling machines and processes, mechanical handling, separation and processing of grain and allied products.

Research Director : G. Watts, B.Sc., A.C.G.I.

Number of Qualified Staff (Degrees) : 2.

Floor Space : 2,000 sq. ft.

Publications : Lockwood, J. F., *Flour Milling* (1945), 25s. and *Provender Milling* (1945), 15s. (Northern Publishing Co., 37, Victoria Street, Liverpool).

Inquiries : (Research) G. Watts, B.Sc. ; (Flour treatment) J. W. Dinsdale.

SMITH & WALTON, LTD., Hadrian Varnish Works, Haltwhistle, Northumberland.

Laboratory : As above.

Subject of Research : Surface coating, synthetic resins, high performance oils and varnishes ; paints, enamels.

Research Director : A. I. Escolme, B.Sc., Ph.D., A.R.I.C.

Number of Qualified Staff : 2.

Floor Space : 2,500 sq. ft.

SOUTH DURHAM STEEL & IRON CO., LTD., CARGO FLEET IRON CO., LTD., Cargo Fleet, Middlesbrough.

Laboratory : As above.

Subject of Research : Improvement in quality and development of new products, relative to large composite iron and steel plants, also development and research in all types of welding.

Floor Space : 10,000 sq. ft.

Annual Expenditure : £24,000.

SOUTH METROPOLITAN GAS CO., 709, Old Kent Road, London, S.E.15.

Laboratory : As above.

Subject of Research : Coal carbonisation and gasification, gas purification and utilisation of by-products ; appliance design and development ; physics of gas combustion.

Chief Chemist : H. Stanier, M.A.(Cantab.), F.R.I.C.

Chief Technical Officer (District) : Dean Chandler, M.I.H. & V.E., M.I.G.E., F.I.E.S.

Number of Qualified Staff : 13.

Floor Space : 8,000 sq. ft. approx. *Annual Expenditure* : Approx. £30,000.

Publications : Gas Research Board and Institution of Gas Engineers, Technical Papers G.R.B. 27 and I.G.E. 223 and 266, etc.

SPEAR & JACKSON, LTD., "The Towers," Sandygate, nr. Sheffield.*Laboratory* : Astra Works, Sheffield.*Subject of Research* : Thermo-static bi-metals; precision tool casting; cutting alloys.*Research Director* : D. F. Gordon, B.Met., A.I.M.*Number of Qualified Staff* : 2.*Floor Space* : 2,000 sq. ft. (approx.). *Annual Expenditure* : £2,000-£4,000.**PETER SPENCE & SONS, LTD.,** National Buildings, St. Mary's Parsonage, Manchester, 3.*Laboratory* : Moorfield Road, Widnes.*Subject of Research* : Aluminium compounds.*Research Director* : H. Bassett, D.Sc., Ph.D., D.ès.C., F.R.I.C.*Floor Space* : 5,000 sq. ft.**SQUARE GRIP REINFORCEMENT CO., LTD.,** 20, Ashley Place, London, S.W.1.*Laboratory* : Windmill Road, Sunbury-on-Thames, Middlesex.*Subject of Research* : All matters concerned with the improvement of reinforced concrete construction; steel reinforcement in concrete, vibration of concrete.*Research Director* : G. L. Glegg, M.A., A.M.I.C.E., A.M.I.Struct.E., A.M.I.Mech.E.*Number of Qualified Staff* : 2.*Floor Space* : 1,500 sq. ft.*Annual Expenditure* : £2,000.*Publications* : In *J. Inst. Struct. Engineers*.**STANDARD OIL DEVELOPMENT COMPANY OF AMERICA, see ESSO DEVELOPMENT COMPANY LIMITED.****STANDARD TELEPHONES & CABLES, LTD.,** Connaught House, Aldwych' London, W.C.2.*Laboratories* : Enfield; Ilminster; New Southgate; Sidcup; North Woolwich.*Subject of Research* : Telecommunications, cables and allied subjects.**STANDFAST DYERS & PRINTERS LTD., see MORTON SUNDOWN FABRICS, LTD.****STAVELEY COAL & IRON CO., LTD., THE, and BRADLEY & FOSTER LTD.,** Hollinwood, Chesterfield, and Darlaston, Staffs.*Laboratories* : At Staveley and Darlaston.*Subject of Research* : Organic and inorganic chemistry, electro-chemistry, and ferrous metallurgy.*Research Director* : J. E. Hurst, D.Met., M.I.Mech.E., F.I.M., J.P.**STEETLEY CO., THE, including THE REFRACTORY BRICK OF ENGLAND and THE BRITISH PERICLASE CO.,** Steetley, Worksop, Notts.*Laboratories* : Worksop and Hartlepool.*Subject of Research* : Development of processes for the manufacture of refractory and other products from magnesian limestone. Fundamental and applied research on basic refractories.*Research Managers* : Hartlepool : W. C. Gilpin, A.R.C.S., Ph.D. Worksop : C. Booth, Ph.D.*Number of Qualified Staff* : 6.*Floor Space* : 6,000 sq. ft.*Annual Expenditure* : £15,000.*Publications* : In *J. Soc. Chem. Ind.*, *J. Refractories J.*, *J. Iron and Steel Inst.***J. STONE & CO., LTD.,** Deptford, London, S.E.14.*Laboratory* : Metallurgical Department, Deptford, London, S.E.14.*Subject of Research* : Metallurgical; non-ferrous alloys, cast and forged products, bronze, aluminium and magnesium alloys, e.g., corrosion and erosion in marine propellers, fatigue in bearing metals, creep of magnesium alloys.*Research Director* : A. J. Murphy, M.Sc.*Publications* : Papers in *J. Inst. Metals* and *Trans. Inst. Marine Engineers*.**SUBMARINE CABLES, LTD., see TELEGRAPH CONSTRUCTION & MAINTENANCE CO., LTD.**

SUTCLIFFE, SPEAKMAN & CO., LTD., Leigh, Lancs.

Laboratory : As above.

Subject of Research : Production, properties and industrial applications of all types of activated carbon ; production and testing of various types of bricks, briquettes, stampings and pressings ; design and development of chemical engineering plant associated with the above.

General Direction : E. C. R. Spooner, D.Sc., B.E., D.Phil., M.I.Chem.E.

Research Supt. : D. H. Sharp, B.Sc.

Number of Qualified Staff : 10.

Annual Expenditure : £10,000.

SYNTICS, LTD., Baythorne House, Gordon Street, London, E.13.

Laboratory : As above.

Subject of Research : Synthetic resins and plastic materials.

Research Director : H. R. Hamburg, Ph.D.

Number of Qualified Staff : 2.

TATE & LYLE, LTD., 52, Cadogan Square, London, S.W.1.

Laboratory : Temporary premises at Plaistow Wharf, Victoria Docks, London, E.16.

Subject of Research : Processes and materials used in sugar manufacture ; microbiology of sugar products ; physico-chemical constants of sugars ; ion exchange adsorbents ; analytical methods.

Number of Qualified Staff : 16.

Publications : Papers in *Analyst*, *International Sugar J.*, *J. Soc. Chem. Ind.*, etc.

TAYLOR, TAYLOR & HOBSON, LTD., Stoughton Street Works, Leicester.

Laboratory : As above.

Subject of Research : Optical systems for photographic projection, precision measurement, and similar purposes. Fundamental research into the nature and measurement of surface finish. Electronic research relating to devices for accurate measurement and the control of machine tools.

Research Director : A. Warmisham, M.Sc.(Man.), F.Inst.P.

Number of Qualified Staff : 13.

TAYLOR, TUNNICLIFF & CO., LTD., Eastwood, Hanley, Stoke-on-Trent.

Laboratory : As above.

Subject of Research : Development of ceramic insulation for high and low tension electric transmission and all types of ceramics for electrotechnical and associated purposes.

TAYLORCRAFT AEROPLANES (ENGLAND) LTD., now AUSTER AIRCRAFT, q.v.**TELEGRAPH CONDENSER CO., LTD., THE, Wales Farm Road, North Acton, London, W.3.**

Laboratory : As above.

Subject of Research : Dielectrics and fixed capacitors of all types.

Research Director : J. H. Cozens, B.Sc., A.M.I.E.E.

Publications : Papers in *J. Brit. Inst. Radio Engineers*.

TELEGRAPH CONSTRUCTION & MAINTENANCE CO., LTD. in association with SUBMARINE CABLES, LTD., 22, Old Broad Street, London, E.C.2.

Laboratories : Telcon Works, Greenwich, London, S.E.10.

Subject of Research : Electric cables, comprising submarine telegraph and telephone cables, audio and radio frequency cables, power transmission cables. Thermo-plastic materials and mouldings. Metals, comprising magnetic and resistance alloys and beryllium copper.

Technical Director : J. N. Dean, B.Sc., A.R.I.C., F.I.R.I.

Metals Director : W. F. Randall, B.Sc., A.R.S.M., M.I.E.E., F.I.M.

Technical Manager (Submarine Cables, Ltd.) : E. W. Smith, Ph.D., B.Sc., M.I.E.E.

Technical Manager (T.C.M. Co., Ltd.) : H. F. Wilson, B.Sc., A.R.I.C., A.I.R.I.

Number of Qualified Staff : 23.

Floor Space : 10,000 sq. ft.

Annual Expenditure : £50,000.

Publications : Papers in *J. Inst. Electrical Engineers*, *Times Trade and Engineering Supplement*, *Wireless Engineer*, *British Plastics*, *J. Inst. Rubber Industry*, *Electrical Review*, *Metal Industry*. Also paper read before R.S.A.

Information Officer (Metals Research) : H. H. Scholefield, Ph.D., B.Sc., A.Inst.P.

JAMES TEMPLETON & CO., Templeton Street, Glasgow, S.E.
Laboratory : Research Department, Templeton Street, Glasgow, S.E.
Subject of Research : Carpets.
Research Director : G. Barker, Ph.D., M.Sc.(Hons.), F.T.I.

JOSEPH TERRY & SONS, LTD., Bishopthorpe Road, York.
Laboratory : As above.
Subject of Research : Chocolate manufacturing ; technical problems.
Research Director : H. B. Marston, B.Sc., A.R.I.C.

THERAPEUTIC RESEARCH CORPORATION OF GREAT BRITAIN, LTD., 19, Buckingham Street, Strand, London, W.C.2.
Subject of Research : Chemotherapy.
Member-Companies (q.v.) : Boots Pure Drug Co., Ltd. ; The British Drug Houses, Ltd. ; Glaxo Laboratories, Ltd. ; May & Baker, Ltd. ; The Wellcome Foundation, Ltd.

THOMPSON BROS. (BILSTON), LTD., Bradley Engineering Works, Bilston, Staffs., and New Yard Engineering Works, St. Georges, Oakengates, Shropshire.
Laboratory : In process of reconstruction ; research meanwhile carried on by outside firms.
Subject of Research : Electric and oxy-acetylene welding.
Research Director : Not yet appointed.

JOHN THOMPSON ENGINEERING CO., LTD., Wolverhampton.
Laboratory : As above.
Subject of Research : Welding with particular reference to pressure parts, boilers, etc. ; metallurgical ; heat resisting and high tensile steels, corrosion resisting materials, etc. ; chemical—boiler feed and industrial water treatment ; fuels.
Number of Qualified Staff : 4.
Awards : Contributions to Research Associations.
Publications : Numerous internal publications.

TINTOMETER, LTD., THE, The Colour Laboratory, Salisbury.
Laboratory : As above.
Subject of Research : Colorimetry ; improvements in colorimetric instruments, apparatus and accessories ; glass colour filters, fused glassware, glass engineering problems.
Managing Director : G. S. Fawcett.
Publications : Papers in *J. Soc. Chem. Industry*, *Procs. Physical Soc.*, etc.

TOOTAL BROADHURST LEE, CO., LTD., 56, Oxford Street, Manchester.
Laboratory : As above.
Subject of Research : The whole field of textile science.
Research Manager : J. T. Marsh, M.Sc., F.R.I.C., F.T.I.
Floor Space : 11,700 sq. ft.

TRINIDAD LEASEHOLDS, LTD., Salisbury House, London, E.C.2.
Laboratories : King's Langley, Herts. and Trinidad, B.W.I.
Subject of Research : Production, properties and utilisation of hydrocarbon oils and their derivatives.
Research Director : S. M. Blair, M.Sc., F.Inst.Fuel, F.Inst.P., etc.

TUBE INVESTMENTS, LTD., Department of Development and Research, Plume Street, Aston, Birmingham, 6.
Laboratory : As above and at Wheelwright Road, Erdington, Birmingham, 24.
Subject of Research : Manufacture and properties of steel tubes, aluminium sheet strip tubes sections, electrical accessories, cycles ; ancillary operations and products. Semi-production scale activities in connexion therewith in mechanical and electrical engineering, metallurgy, etc.
Research Director : J. W. Jenkin, Ph.D., B.Sc., A.R.I.C., F.I.M.
Number of Qualified Staff : 30 (approx.).
Floor Space : 55,000 sq. ft. (approx.).
Publications : Various.
Information Officer : L. T. Oldaker

TURNER BROTHERS ASBESTOS CO., LTD., Rochdale, Lancs.

Laboratory : As above.

Subject of Research : Asbestos products for the mechanical automobile, electrical and chemical engineering industries. Combination of asbestos with rubber (natural and synthetic), plastics, etc. ; high pressure jointings and packings ; all types of asbestos textile products ; conveyor and transmission belting.

Research Director : E. L. Dawson, F.R.I.C., A.I.R.I.

Publications : In *J. Soc. Chem. Ind.*

TURNER MANUFACTURING CO., LTD., Moorfield Road, Wolverhampton.

Laboratory : As above.

Subject of Research : Hydraulic research of all kinds. Hydraulic pumps up to powers of 20 H.P.

Research Director : F. C. Hale, B.Sc.

ULTRA ELECTRIC, LTD., Western Avenue, Acton, London, W.3.

Laboratory : As above.

Subject of Research : Thermionics, electronics, radio and television.

Research Director : Col. L. V. W. Clark, Ph.D., M.Sc., M.I.Mech.E., F.Inst.Petroleum.

Number of Qualified Staff : 15.

Floor Space : 10,000 sq. ft.

Annual Expenditure : £25,000.

UNITED DAIRIES, LTD., 34, Palace Court, Bayswater, London, W.2.

Laboratory : Wood Lane, London, W.12.

Subject of Research : Production, utilisation and distribution of milk and all milk products.

Research Director : E. B. Anderson, M.Sc., F.R.I.C.

Annual Expenditure : £15,000.

UNITED STEEL COMPANIES, LTD., THE, 17, Westbourne Road, Sheffield, 10.

Central Laboratories : Research and Development Department, Stocksbridge, nr. Sheffield. Also works laboratories for routine control purposes at each of the iron and steelmaking branches of the Combine. (New laboratories to accommodate all the Research and Development Staff on one site are to be built at Swindon House, near Rotherham).

Subject of Research : Problems relating to ores, iron, steel and allied subjects, under 8 main divisions, viz : metallurgical, chemical, physics, x-ray, welding, refractories, petrological and statistical. Special attention is devoted to the investigation of fatigue, creep and general high temperature properties of steel, the beneficiation of iron ores, iron and steelmaking procedure including also the study of melting furnace design, refractories, fuel efficiency, welding problems relating both to electrodes and to fabrication, corrosion prevention, etc.

Research Director : F. H. Saniter, B.Eng. *Assistant Director* : J. H. Chesters, D.Sc.

**Secretary, Research and Development Department* : G. H. Davison.

* The Secretary controls the library and is responsible for the issue of all technical reports on the work of the laboratory.

Research Manager : W. E. Bardgett, B.Sc., A.M.I.Mech.E., F.I.M.

Number of Qualified Research Staff : 51.

Floor Space : 40,000 sq. ft. (20,000 sq. ft. at Stocksbridge and 20,000 sq. ft. at Rotherham).

Publications : 24 papers read before various learned societies. Also, *Standard Methods of Analysis and Steelplant Refractories*, the latter by Dr. J. H. Chesters, and contributions to Iron and Steel Institute Special Report No. 37 *The Influence of Port Design on Open-Hearth Furnace Flames*. For details, see Bibliography under Metals.

Information Officer : R. Sewell.

UNIVERSAL GRINDING WHEEL CO., LTD., Universal Works, Stafford.

Laboratory : As above.

Subject of Research : Abrasives, grinding wheels and allied products.

Research Director : J. G. Cowan, B.Sc., F.I.C., A.R.C.S.

VANTONA TEXTILES, LTD., 107, Portland Street, Manchester, 1.*Laboratory* : Ainsworth Mill, Brightmet, Bolton, Lancs.*Subject of Research* : Textiles and textile finishes.*Research Manager* : L. Morris, B.Sc.(Tech.), A.R.I.C.*Floor Space* : 3,150 sq. ft.*Information Officer* : Dennis C. Hayes, M.I.A.M.A. (Publicity Manager).**VIROL, LTD.,** Hanger Lane, Ealing, London, W.5.*Laboratory* : As above.*Subject of Research* : Nutritional value of foodstuffs and improvements in chemical, biological and micro-biological methods for the analysis of foods.*Research Director* : E. C. Wood, Ph.D., A.R.C.S., F.R.I.C.*Number of Qualified Staff* : 2.**VITAMINS, LTD.,** 23, Upper Mall, London, W.6.*Laboratory* : As above.*Subject of Research* : Nutrition (human and animal).*Research Directors* : *Administrative* : H. C. H. Graves, B.Sc.(Lond.) ; *Scientific* : M. D. Wright, B.A., M.B., B.S.*Number of Qualified Staff* : 9.*Floor Space* : 6,000 sq. ft. Farm about 100 acres.*Publications* : Papers in *Biochem. J.*, *Brit. J. Endocrinology*, *Brit. Medical J.*, *Chemistry and Industry*, *J. Agric. Science*, *J. Hygiene*, *J. Soc. Chem. Industry*, *Nature*, *Procs. Royal Soc. Medicine*, *Veterinary J.*, *Analyst*, *Lancet*.*Information Officer* : The Librarian.**VITREOUS CONCRETE CO., LTD.,** Raw Dykes Road, Leicester.*Laboratory* : As above.*Subject of Research* : Building materials, and associated products used in all branches of civil engineering.*Research Director* : T. E. Rule, F.R.I.C., A.M.I.Chem.E.*Floor Space* : 5,000 sq. ft.*Annual Expenditure* : £3,000.**C. C. WAKEFIELD & CO., LTD.,** 46, Grosvenor Street, London, W.1.*Laboratory* : Hayes, Middlesex.*Subject of Research* : Lubricants with special reference to chemical additive agents.*Research Director* : E. A. Evans.*Publications* : Papers in *J. Inst. Automobile Engineers* and *J. Inst. Petroleum*.**WALL PAPER MANUFACTURERS, LTD., THE,** King's House, King Street West, Manchester, 3.1. *Laboratory* : A. Sanderson & Sons' Branch, Perivale, Middlesex.*Subject of Research* : Paper, colour, adhesives, engineering, metallurgy, design.*Research Director* : A. R. Wildey.*Floor Space* : 2,385 sq. ft.*Awards* : £1,000 grant to the Manchester Joint Research Council ; annual subscribers to P.A.T.R.A.2. *Engineering Research Station* : Springvale Works, Springvale, Darwen.*Subject of Research* : Engineering and plant research.*Director of Engineering Research* : R. Cunliffe.*Floor Space* : 20,000 sq. ft.*Annual Expenditure* : £10,000 (other than on design).**A. WANDER, LTD.,** 5, Albert Hall Mansions, London, S.W.7.*Laboratory* : Ovaltine Research Laboratories, King's Langley, Herts.*Subject of Research* : Pharmaceutical preparations and nutrition (vitamins, etc.).*Research Director* : F. Wokes, Ph.D.(Lond.), B.Sc.(Liv.), F.R.I.C., Ph.C.*Number of Qualified Staff* : 9.*Floor Space* : 4,500 sq. ft. Farms about 1,000 acres.*Publications* : Papers in *Agriculture*, *Analyst*, *Biochem. J.*, *Food*, *J. Soc. Chem. Ind.*, *Lancet*, *Nature*, *Q. J. Pharm. Pharmacol.*

WATFORD CHEMICAL CO., LTD., 30, Baker Street, London, W.1.*Laboratory* : 325-7, Latimer Road, London, W.10.*Subject of Research* : Heavy and fine chemicals ; production, development and synthesis ; pharmaceutical, especially chemotherapeutics and penicillin. Plastics ; moulding powders and specialised mouldings. Wetting agents, insecticides, etc.*Research Director* : W. K. S. Wallersteiner, M.A.(Cantab.), Ph.D.*Floor Space* : 5,000 sq. ft. *Annual Expenditure* : £15,000-£20,000.*Awards* : One to two post-graduate research scholarships at London University at £325 p.a. Various minor research grants and prizes at Cambridge, etc.*Publications* : Papers in *Medical Press and Circular*, *Nature*, and *Soap, Perfumery and Cosmetics*.**E. R. WATTS & SON, LTD.,** 123, Camberwell Road, London, S.E.5.*Laboratory* : As above.*Subject of Research* : Instruments of metrology ; optical systems ; scientific instruments, optical or physical ; photo-chemical processes.*Research Director* : V. W. H. Towns.*Number of Qualified Staff* : 4.*Floor Space* : 7,000 sq. ft.*Annual Expenditure* : £20,000.**JOSIAH WEDGWOOD & SONS, LTD.,** Barlaston, Stoke-on-Trent.*Laboratory* : As above.*Subject of Research* : Ceramic research ; ceramic materials, new bodies, glazes, etc., and mechanical production research.*Research Director* : N. Wilson.*Number of Qualified Staff* : 3.*Floor Space* : 2,000 sq. ft.*Annual Expenditure* : £5,000.**WELLCOME FOUNDATION, LTD., THE,** 183, Euston Road, London, N.W.1.*Laboratories* : Wellcome Laboratories of Tropical Medicine, Wellcome Historical Medical Museum and Library, Wellcome Museum of Medical Science—as above ; Wellcome Physiological Research Laboratories, Beckenham ; Wellcome Chemical Research Laboratories, Beckenham ; Wellcome Veterinary Research Station, Ely Grange, Frant, Sussex ; Wellcome Entomological Field Laboratories, Esher, Surrey.*Director-in-Chief of Research* : C. H. Kellaway, M.C., M.D., M.S., F.R.C.P.(Lond.), F.R.A.C.P., F.R.S.**WHITBREAD & CO., LTD.,** The Brewery, Chiswell Street, London, E.C.1.*Laboratory* : As above.*Subject of Research* : The chemistry of malt and beer, and of malting and brewing ; yeast production.*Chief Chemist* : B. M. Brown, B.Sc., F.R.I.C.*Publications* : Papers in *J. Inst. Brewing*.**WIGGINS, TEAPE & CO. (1919), LTD.,** Aldgate House, Mansell Street, London, E.1.*1. Laboratory* : c/o Alex. Pirie & Sons, Ltd., Stoneywood Works, Bucksburn, Aberdeenshire.*Subject of Research* : Any papermaking problem. Speciality papers, in particular cheque paper, coated specialties, light fast coloured papers. High wet strength papers and papers for plastics, wet and dry electric recorder papers.*Research Director* : S. R. H. Edge, M.A., F.R.I.C.*Number of Qualified Staff* : 4.*Floor Space* : 7,800 sq. ft.*Annual Expenditure* : £7,000.*Publications* : Papers in *Procs. Tech. Section Paper Makers' Association*.*2. Laboratory* : c/o Wiggins Teape & Co. (1919), Ltd., Glory Mill, Wooburn Green, High Wycombe, Bucks.*Subject of Research* : Raw and Baryta-coated photographic base paper.*Research Director* : H. F. Rance, Ph.D., B.Sc., A.R.C.S.*Number of Qualified Staff* : 3.*Floor Space* : 3,500 sq. ft.*Annual Expenditure* : £7,000.

WILKINSON RUBBER LINATEX, LTD., and WILKINSON NOVATEX LTD., 1-4, Great Tower Street, London, E.C.3.*Laboratory* : Camberley, Surrey.*Subject of Research* : All branches of natural and synthetic rubber and plastics. Also allied with Company's laboratory in Malaya on latex research.*Research Director* : B. Wilkinson, F.I.P.I., A.F.R.Ae.S., A.I.R.I.*Floor Space* : 1,800 sq. ft.**WILLIAMS & WILLIAMS, LTD.,** Reliance Works, Chester.*Laboratory* : As above.*Subject of Research* : Electrical resistance welding; metal finishing process work; electro-plating; analysis of incoming materials, development of aluminium applications, etc.*Research Director* : A. M. Maddox, M.B.E., M.A.*Number of Qualified Staff* : 2.*Floor Space* : 2,000 sq. ft.*Annual Expenditure* : £15,000.*Awards* : Annual Williams and Williams Engineering Scholarship, value £150 p.a. for three years to enable engineering students to attend a full time university course.**GEORGE WIMPEY & CO., LTD.,** Tilehouse Lane, Denham, Uxbridge, Middlesex.*Laboratory* : Lancaster Road, Southall, Middlesex.*Subject of Research* : Concrete, soil mechanics and asphalts.*Research Director* : E. S. Yarwood, B.Sc.*Floor Space* : 3,000 sq. ft.**YORK STREET FLAX SPINNING CO., LTD.,** 114-122, Henry Street, Belfast.*Laboratory* : As above.*Subject of Research* : Spinning, weaving, bleaching, dyeing, and processing of flax and other fibres; fabrics, threads, and other textile materials.*Research Director* : W. Honneyman, B.Sc.(Lond.), Ph.D.(Q.U.B.), F.R.I.C.*Floor Space* : 1,000 sq. ft.**YORKSHIRE DYEWARE & CHEMICAL CO., LTD., THE** (Six Branches and Factories), 24, Lower Basinghall Street, Leeds, 1.*Laboratories* : Kirkstall Road, Leeds; Hunslet Road, Leeds, 10.*Subject of Research* : Dyestuffs and intermediates, dyewood and tanning extracts, chrome tanning liquors, synthetic tans, fat liquors, leather finishes, adhesives. Flocculating agents and laundry products.*Research Directors* : R. C. Storey, Ph.D., M.Sc., F.R.I.C. and O. Low, D.Sc.*Number of Qualified Staff* : 12.*Annual Expenditure* : £10,000.**MULLARD WIRELESS SERVICE COMPANY, LTD.,** Century House, Shaftesbury Avenue, London, W.C.2.*Valve Development Laboratory* : New Road, Mitcham Junction, Surrey.*Vacuum Physics Laboratory* : New Road, Mitcham Junction, Surrey.*Electronic Research Laboratory* : Cross Oak Lane, Salfords, nr. Redhill, Surrey.*Radio Communications Laboratory* : Brathway Road, Wandsworth, S.W.18.*Subject of Research* : Thermionic transmitting and receiving valves; cathode ray tubes, x-ray tubes; high power rectifiers; photocells, centimetric valves and other vacuum devices; medium and high radio frequency circuit investigations; very high radio frequency circuit investigations; television technique; investigations into the use of industrial electronic devices; radio, line and supersonic communications equipment; navigational electronic equipment.*Technical Director* : T. E. Goldup, M.I.E.E.*Heads of Research Departments* : *Valve Research Laboratories* : J. D. Stephenson, M.Sc., Ph.D., including *Valve Development and Design* : F. M. Walker, B.Sc.*Vacuum Physics* : G. Knott, M.A., A.M.I.E.E. *Electronic Research* : C. F. Bareford, M.Sc., Ph.D. *Line Research* : K. E. Latimer, M.B.E., Ph.D., M.I.E.E.*Radio Research* : C. E. G. Bailey, B.A., M.I.E.E.*Floor Space* : 50,000 sq. ft.*Number of Qualified Staff* : 64

Directory of Consultants

The information contained in this Directory was supplied at first hand by the consultants concerned, to all of whom the same form of inquiry was sent.

A Subject-Guide to the various analytical, testing and consultant services herein described will be found at the end of the Directory.

ANALYTICAL SERVICES, 9, Northgate, Dewsbury. (Dewsbury 179).

Field of work, and services offered: Textile and general consulting and analytical. Water, oils, textile industry chemicals; chemical faults in textiles, bedding and furniture fillings; bacteriological tests; effluents; disposal of waste products; fumigation.

Director: E. W. Smith, M.Sc., Ph.D., A.R.I.C.

Number of Qualified Staff: Several experts in various branches of applied chemistry and technology can be called in.

THE WALLACE ATTWOOD COMPANY*, Chantrey House, Eccleston Street, London, S.W.1. (Sloane 0311).

Field of work, and services offered: Business management consultants. Services: solution of problems and implementation of recommendations *re* major company policy; company organisation; product development and marketing, and market research; production organisation and methods; administration, costing and accounts control.

Director: Bedford Attwood, B.Sc., F.S.S.

Number of Qualified Service Staff: 24.

* An Associate Company, Attwood (Statistics) Ltd., covers market research and other statistical work.

AYRTON & CO., LTD., Beech Street Works, Halifax, Yorkshire. (Halifax 2495).

Field of work and services offered: General analytical work.

Director: H. Coates.

M. BARASH, 159, Palace Chambers, Bridge Street, Westminster, London, S.W.1. (Whitehall 4733) and at 70, Parsonage Road, Manchester, 20. (Didsbury 1357).

Field of work, and services offered: Consultant: fuel technology; gas engineering; general chemical engineering; carbonising problems and investigations, design of plant, development of processes and yields. Guarantee testing of installations.

Consultant: M. Barash, Ph.D., M.Sc.Tech., M.Inst.Gas.E., F.R.I.C., M.Inst.F.

BARENT & JOHNSON, 4, New Court, Lincoln's Inn, London, W.C.2. (Holborn 0976).

Field of work, and services offered: Consulting chemists and industrial consultants. Processes in solution e.g. metal finishing, corrosion problems; manufacture of salts, proteins and protein products, carbohydrates and wood products. Process development, fundamental investigations. Physico-chemical methods of analysis, recording and control.

The policy is primarily to direct research and development work on behalf of industrial companies, preferably dealing with complete industrial processes. Wherever possible and desirable, personnel and facilities of industrialists are employed. Functions include advising clients and patent agents on the technical soundness of processes for which patent protection may be sought.

Director: Either M. Barent, B.Sc., Ph.D., A.R.I.C. or S. W. Johnson, B.Sc., Ph.D., A.R.I.C.

Number of Qualified Staff: 2.

HARRY BARRON, 30, Shaftesbury Avenue, Southampton.

Field of work, and services offered: Plastics, rubber and synthetic rubber commercial and industrial development.

Director: Dr. Harry Barron, Ph.D., B.Sc., F.R.I.C., F.I.R.I.

Number of Qualified Staff: 3.

PERCY BEAN, 189, Moor Lane, Woodford, nr. Stockport, Cheshire.

Field of work, and services offered : Analytical and consulting chemists. Textiles (including dyeing, bleaching and finishing); pulp and paper; foods and drugs; water; oils; individual investigations.

Consultant : Percy Bean, Ph.D., M.Sc., A.M.C.T., A.T.I.

BLACKBURN & POLLETT, First Avenue House, High Holborn, London, W.C.1. (Holborn 2105).

Field of work, and services offered : Consulting chemists and engineers and chartered patent agents; advises on technical matters in connection with applications for British and foreign patents for inventions and patent litigation.

Consultants : R. I. Blackburn, M.A.Cantab., B.Sc.Lond., A.R.I.C., F.C.I.P.A.; E. H. Pollett, B.Sc.(Eng.)Lond., A.M.I.C.E., A.M.I.E.E., F.C.I.P.A.

Number of Qualified Staff : 2.

E. R. BOLTON,* 6, Milner Street, London, S.W.3. (Kensington 8050).

Field of work, and services offered : Analysts, technical and consulting chemists, specialising in analysis and technology of foodstuffs, including oils, fats and fatty foods; of petroleum; of tobacco, etc.

Consultant : K. A. Williams, B.Sc., M.Inst.Pet., F.R.I.C.

* E. R. Bolton is the registered business name of K. A. Williams.

THE BRITISH INDUSTRIAL DEVELOPMENT ORGANISATION*, Lynton, Princes Avenue, Walsall. (Walsall 6305).

Field of work, and services offered : Industrial research, mainly plastics, metallurgy, paper-making and printing machinery. Development of new processes or materials, design of specialised machinery, laboratory analysis, etc., and production planning undertaken for all industries.

Director : J. W. Day, F.S.C., M.I.S.A. (other qualifications pending).

Number of Qualified Staff : 14; also associated indirectly with 45 others.

* International Industrial Development Organisation (I.I.D.O.) works on the same lines but in collaboration with American and Swiss technicians, whereas B.I.D.O. functions primarily for British industry.

BRYSON PROCESSES, LTD. See list of Research Laboratories of Private Firms, page 347.

ARTHUR S. CARLOS, 2A, Wimborne Road, Bournemouth. (Bournemouth 1359 and Highcliffe 232).

Field of work, and services offered : Agricultural products (including insecticides and fertilisers), treatment of sewage and effluents, manufacturing food problems, certain dyestuffs. Analytical and consulting work undertaken as well as the above—also gas examinations.

Consultant : Arthur S. Carlos, B.Sc.(Lond.), F.R.I.C.

COOK & BARKE, Western Counties Laboratory, 34, Park Row, Bristol, 1. (Bristol 21152).

Field of work, and services offered : Analytical chemists; public and agricultural analysts; foods, water, sewage and general analysts.

Consultant : Harold F. Barke, F.R.I.C.

H. E. J. CORY, Eagle Chemical Works, Church, nr. Accrington, Lancs. (Accrington 2570).

Field of work, and services offered : General consultant for chemical industry, commercial and technical; specialist for chlorinated phenols, bichromates and chrome products, sulphuric acid, insecticides.

Consultant : H. E. J. Cory, M.Sc.Tech.(Manc.), M.I.Chem.E., F.R.I.C., F.C.I.C.

D. H. B. COWMAN, The Laboratory, Worth Matravers, nr. Swanage, Dorset.

Field of work, and services offered : Consulting chemist; manufacturing problems, origination and development of formulae and processes; building materials; asbestos; toilet preparations; water proofing; food preparations. Analytical and experimental work in connection with above problems.

Consultant : D. H. B. Cowman, B.Sc.(Lond.), F.R.I.C.

Number of Qualified Staff : 1.

WILFRED F. COXON, 27, Mount Park Road, Ealing, London, W.5.

Field of work, and services offered : Scientific advisory service—new materials and patents ; specialist on metal finishing and corrosion problems ; technical advertisement copy.

Consultant : W. F. Coxon, M.Sc., Ph.D., F.R.I.C., F.I.M.

SIR WILLIAM CRAWFORD & PARTNERS, LTD., 233, High Holborn, London, W.C.1. (Holborn 4381).

Field of work, and services offered : Specialists in product design, packaging, and display.

Director : E. C. Mackenzie.

T. CROSBIE-WALSH, 44, Woodcrest Road, Purley, Surrey. (Uplands 3570).

Field of work, and services offered : Food research ; food consultant (technology).

Consultant : T. Crosbie-Walsh, F.R.I.C.

CROSS & BEVAN, Edgeworth House, Arlesey, Bedfordshire (Arlesey 92) and 3 & 4, New Court, Lincoln's Inn, London, W.C.2. (Holborn 1629).

Field of work, and services offered : Raw materials for the rayon and paper industries ; cellulose and cellulosic raw materials generally, pulping and physical testing.

Director : L. G. S. Hebbs, F.R.I.C.

Number of Qualified Staff : Generally 3 to 5.

DE HAVILLAND AIRCRAFT CO., LTD., *see* section : Research Laboratories of Private Firms, p. 351.

DUMVILLE & Warburton, 3, Burrow Street, Bradford. (Bradford 1294).

Field of work, and services offered : Complete consulting services in the textile industry : the analysis of fabrics, yarns and raw materials ; advising on plant and lay-out, etc.

Consultants : Joseph Dumville, Fellow of the Textile Institute. John Warburton, F.C.S., F.R.M.S., Research Medallist of the Worshipful Company of Woolmen, London.

Number of Qualified Staff : 4.

DUNFORD SMITH & MOORE, *see under* SMITH.

F. W. EDWARDS, Analytical Laboratories, Royal Dental Hospital, Leicester Square, London, W.C.2. (Whitehall 5329 and Wimbledon 3241).

Field of work, and services offered : Analysis of food, drugs, water, etc.

Consultant : F. W. Edwards, F.R.I.C.

KARL B. EDWARDS, Ormond Laboratories, 12, Whidborne Street, London, W.C.1.

Field of work, and services offered : Nicotine examination and manufacture ; insecticides ; coal tar by-products ; wood pulp by-products ; general consultant on technical economics.

Consultant : Karl B. Edwards, B.Sc.(Hons.), Ph.D.(Lond.), F.R.I.C.

Number of Qualified Staff : Normally 2.

OLIVER C. DE C. ELLIS, 16, Heaton Road, Manchester, 20. (DIDsbury 3023).

Field of work, and services offered : Fires, Explosions and Industrial Hazards. Investigation of the cause of a particular fire or explosion ; advice both on actual responsibility and on legal onus ; preparation of case for counsel ; expert witness in court ; advice on installations and improvements ; special investigations for firms interested in particular substances or methods of fire prevention and extinction ; proper practice in the handling of corrosive fluids, noxious gases, etc.

Consultant : Oliver C. de C. Ellis, D.Sc., Ph.D., M.A., F.R.I.C., F.R.P.S., A.M.I.Min.E.

Number of Qualified Staff : 1.

HERBERT J. EVANS, Public Analyst's Office, County Hall, The Castle, Carmarthen, South Wales.

Field of work, and services offered : Public analyst and consulting chemist : analysis of foods and drugs with special reference to grocery and confectionery trades ; water supplies, trade effluents, etc.

Consultant : Herbert John Evans, B.Sc., F.R.I.C.

H. RONALD FLECK, The Beacon, Main Road, Biggin Hill, Kent. (Biggin Hill 331).

Field of work, and services offered : Industrial chemistry and chemical engineering. Specialising in plastics and paint, design of plant and processes, analytical and research experimental work, formulation, pilot plant and full scale production application of plastics to industrial problems.

Consultant : H. Ronald Fleck, M.Sc.(Lond.), F.R.I.C.

FOUNDRY SERVICES, LTD. This firm does a certain amount of consultant work for metal foundries of all descriptions. It is mainly analytical and microscopical work of a routine character, not research. See entry for Foundry Services in the section, Research Laboratories of Private Firms, page 355.

FRANKS LABORATORIES, LTD., 61B, Dartmouth Road, Forest Hill, London, S.E.23. (Forest Hill 3157).

Field of work, and services offered : Chemical consultant or technical advice, research and development in the field of coal, gas and tar products, paint, plastics, mineral oil, rubber and paper pulp ; also certain fields of physical chemistry.

Director of Research : F. J. Burger, Ph.D.

Number of Qualified Staff : 2.

W. & I. M. GARNER, 15, George Street, London, E.C.4. (Mansion House 2787).

Field of work, and services offered : Textiles (processes, fabrics, testing) ; colour (dyes, dyeing, printing, vision, illumination) ; lubricants (oils, emulsions) ; insulation (heat, vibration, sound) ; water (industrial, boiled) ; biology (insects, mildew) ; research (industrial, process development).

Consultant : Walter Garner, M.Sc., F.R.I.C., F.T.I.

Number of Qualified Staff : 2.

R. GENDERS, Green Ridges, The Meadow, Chislehurst, Kent. (Imperial 3135).

Field of work, and services offered : Consultant on : metallurgical processes dealing with all metals ; working, heat-treatment, investigation of failures. Patents and development work. Advice on organisation and conduct of research.

Consultant : Dr. R. Genders, M.B.E., D.Met., F.R.I.C., F.I.M.

Number of Qualified Staff : 1.

GENERAL AIRCRAFT LIMITED. This firm is prepared to consider the undertaking of research work within its own field for outside organisations. See entry for General Aircraft in the section, Research Laboratories of Private Firms, page 356.

JOHN GODRICH, 22, Bennett's Hill, Birmingham, 2. (Mid. 1018).

Field of work, and services offered : *Techniview*—digest of technical press. Works planning and layout. Production engineering in all its phases.

Director : John Godrich.

Number of Qualified Staff : Staff of engineers specialising in costs, time study, management, design.

G. WATSON GRAY, 8, Inner Temple, Dale Street, Liverpool, 2. (Cen. 5116).

Field of work, and services offered : Sampling and analysis of metals and minerals.

Consultant : James Smith, F.R.I.C.

GREY OWL RESEARCH LABORATORIES, Knole Park, Almondsbury, Gloucs. (Almondsbury 3245).

Field of work, and services offered : Production of formulae and process for the food industry ; research on specific problems affecting food quality ; canning, jams, jellies and pickles, beverages, bakery and confectionery products, packed grocery lines ; facilities for preparation of technical notes, recipes and sales literature.

Consultant : S. M. Tritton, F.R.I.C.

GUTHRIE, ADAMS & CO., 4, Leighton Lane, Leeds, 1. (Temporary Telephone No : Leeds 23682).

Field of work, and services offered : Chemical, metallurgical and foundry consultants : Complete chemical analysis service for all ferrous and non-ferrous metals, sands and refractories. Mechanical testing on engineering materials, also metallography, metallurgical industrial research, including heat treatment of metals. Installations of foundry mechanised plants, and general foundry consulting.

Director : Donald Guthrie, M.I.B.F., E.E.S.F.

Number of Qualified Staff : 3.

A. J. HALL, Sutton Road, Somerton, Somerset. (Somerton 109).

Field of work, and services offered : Consultant to the textile trade and related industries.

Consultant : A. J. Hall, B.Sc., F.R.I.C., F.T.I.

HALSE & MARSHALL, 33, Trinity Square, London, E.C.3. (Royal 3586).

Field of work, and services offered : Mainly analysis especially foods ; prepared to carry out small researches in the laboratory ; prepared to consider problems arising in connection with foods, oils and waxes, in so far as they can be investigated in the laboratory.

Directors : W. M. Seaber, B.Sc., F.R.I.C. ; R. A. Rabnott, F.C.S.

Number of Qualified Staff : 1.

H. AINSWORTH HARRISON, Vale House, Horwich, Lancs. (Horwich 283).

Field of work : Paper in all its aspects.

Consultant : H. Ainsworth Harrison, M.Sc., Ph.D., F.R.I.C.

K. H. HARRISON, 30, Wensleydale Avenue, Ilford, Essex. (Wanstead 6031).

Field of work, and services offered : Cleaning, dyeing, bleaching of textiles, etc. ; synthetic resins and plastic finishes ; detergents, emulsions, solvents and insecticides ; fuel testing ; adhesives.

Consultant : K. H. Harrison, B.Sc.(Lond.), A.R.I.C.

Number of Qualified Staff : 1.

HAWKINS & HAWKINS, 19, Watling Street, Canterbury, Kent. (Canterbury 3033).

Field of work, and services offered : Food, water ; general analysis ; bacteriology ; dairy products.

Directors and Consultants : E. M. Hawkins, F.R.I.C. ; E. S. Hawkins, O.B.E., B.Sc., A.R.C.S., F.R.I.C.

HEHNER & COX, 10, Billiter Square, London, E.C.3. (Royal 3538).

Field of work, and services offered : Consulting chemists, analysts ; investigation on organic chemical products, foods, patents, etc.

Director : Henry Edward Cox, D.Sc., Ph.D., F.R.I.C.

Number of Qualified Staff : 5.

HERD & MUNDY, 47, Weymouth Street, London, W.1. (Welbeck 7835).

Field of work, and services offered : Analysis, consulting and research : foods, cereals, drugs, pharmaceuticals, toxicology, oils, waxes, fuels ; industrial research and works service.

Directors : C. W. Herd, Ph.D., B.Sc., F.R.I.C. ; L. M. Mundy, F.R.I.C., Ph.C.

Number of Qualified Staff : 3.

INDUSTRIAL AND COMMERCIAL ORGANISERS, 121, Victoria Street, London, S.W.1. (Victoria 4550).

Field of work, and services offered : Increasing production ; reducing costs ; improving administration ; organisation of sales, distribution, etc. Accurate determination of costs ; budget control, market research.

Director : Lt.-Col. Max K. Staub, F.A.I.A., M.Inst.Br.E., A.Inst.P.E., Ingénieur Civil de France.

Number of Qualified Staff : 5.

INDUSTRIAL TESTING AND RESEARCH LABORATORIES, 13, Market Street, Bradford, Yorks. (Bradford 5151).

Field of work, and services offered : Analytical and consulting chemists : textiles ; food and drugs ; paints, oils and fats ; electro-conductivity measurements ; lubrication and corrosion investigations.

Director : Edgar Hill, A.R.C.Sc., F.R.I.C., Ph.C.

JACKSON & HOUSE, 16, Deansgate, Manchester, 3. (Blackfriars 4281).

Field of work, and services offered : Consulting chemists : water supplies, boiler feed water, fuel, and electric power station practice ; chemical problems.

Consultant : Cecil John House, B.Sc.(Lond.), A.R.C.S., F.R.I.C.

S. J. JOHNSTONE, 17, Clifford Road, New Barnet, Herts. (Barnet 4730).

Field of work, and services offered : Consultant on mineral resources and their utilisation, with special reference to those of the British Commonwealth.

Consultant : Sydney J. Johnstone, O.B.E., B.Sc.(Lond.), F.R.I.C., M.Inst.M.M.

Publications : *The Rare Earths Industry*, *Mining Royalties and Rents in the British Empire*, *Potash*, *Empire Mineral Resources and their Relation to the War Effort*, *Minerals for Chemical Industry*, at present appearing as articles in the *Industrial Chemist* ; to be published subsequently in book form.

F. G. KENT, 20, Kinnerton Street, Knightsbridge, London, S.W.1. (Sloane 8497) and Keeres Green, Aythorpe Roding, Dunmow, Essex (White Roding 249).

Field of work, and services offered : Design and lay-out of chemical plant ; liquefaction of industrial gases ; oxygen production ; applications of the heat-pump principle ; fundamental chemical engineering research.

Consultant : F. G. Kent, B.Sc., A.R.I.C., M.I.Chem.E., M.Inst.F.

Number of Qualified Staff : 4.

E. S. KREIS, Mayfield, Sussex. (Mayfield 237).

Field of work, and services offered : Consulting and research chemist ; analyst : industrial minerals ; electrochemical processes ; talc, graphite, magnesite, mica, dry batteries.

Consultant : E. S. Kreis, B.Sc., A.R.C.S., A.R.I.C.

HUBERT LAWRIE, 397, Padiham Road, Burnley, Lancs. (Burnley 2837).

Field of work, and services offered : Bio-chemical analysis, particularly as aid to diagnosis. Haematology.

Consultant : Hubert Lawrie, B.Sc.(Glas.), As.Inst.Med.Lab.Tech.

H. T. LEA & MALLINDER, Borough Laboratory, National Provincial Bank Chambers, Halifax (Halifax 2826). Borough Laboratory, 26, Ramsden Street, Huddersfield (Huddersfield 843).

Field of work, and services offered : Analytical and consulting chemists, public analysts and official agricultural analysts : foods, drugs, water and milk (bacteriological and chemical) ; fertilisers, feeding-stuffs ; textiles, oils and soaps.

Director : R. Mallinder, B.Sc.(Lond.), F.R.I.C.

R. LESSING, 3, Thorney Court, Palace Gate, London, W.8. (Western 4022).

Field of work, and services offered : Fuel technology, coal research, specialising in coal preparation ; chemical engineering, particularly in connexion with packed towers.

Consultant : R. Lessing, Ph.D.(Munich), F.Inst.F., M.I.Chem.E., M.Inst.Gas.E., F.Inst.Pet., M.I.Min.E., F.R.I.C.

P. D. LIDDIARD, Boscombe Chine Gardens, Christchurch Road, Bournemouth and 5, Endsleigh Gardens, Surbiton.

Field of work, and services offered : Consulting metallurgical chemist covering surface treatment (degreasing, pickling, protection, and plating) of ferrous and non-ferrous metals and alloys ; cold working ; lubrication.

Consultant : P. D. Liddiard, B.Sc.(Lond.), F.R.I.C., A.I.M.

Number of Qualified Staff : 1.

THOMAS McLACHLAN & PARTNERS, 4, Hanway Place, London, W.1. (Museum 4501). Abbey Gateway, Reading (Reading 4501).

Field of work, and services offered : Food, pharmacy, cosmetics, microbiology, standardisation by animal tests. Whilst this practice is primarily analytical, it has a separate research laboratory, and a pilot plant laboratory is in course of construction.

Director : Thomas McLachlan, D.C.M., A.C.G.F.C., F.R.I.C.

Number of Qualified Staff : 6.

ALEX. W. McLAREN, Ramsden Dock, Barrow-in-Furness, (Barrow-in-Furness 9).

Field of work, and services offered : Specialising on the sampling and analysis of ores, mainly blast furnace ores, and mine examinations. No research work undertaken, mainly a service for the blast furnace industry.

Director : Alex. W. McLaren, F.R.I.C.

Number of Qualified Staff : 6 experienced chemists and samplers.

MANCHESTER ANALYTICAL LABORATORIES, Deansgate Arcade, Manchester 3. (Bla 0245).

Field of work, and services offered : Investigations and research in any manufacturing problems which depend on the application of chemical knowledge and experience for their solution. Specialised experience in detergent problems and those connected with the fatty oil industries.

Director : Archibald Rayner, B.Sc., F.R.I.C.

Number of Qualified Staff : 1.

MARKWELL & EDWARDS, 129, Brunswick Road, Ealing, London, W.5. (Perivale 3878) and 589, High Road, North Finchley, London, N.12. (Hillside 5806).

Field of work, and services offered : Analytical and consulting chemists : pharmaceutical and cosmetic industries ; foods, drugs, water, galenicals ; fixed and essential oils, waxes and gums ; toilet preparations.

Consultants : W. A. N. Markwell, F.R.I.C. and C. Edwards, B.Sc.(Hons. Lon.), F.R.I.C., Ph.C.

Number of Qualified Staff : 3.

A. W. MIDDLETON, 33, Devereux Drive, Watford, Herts. (Watford 4642).

Field of work, and services offered : Cosmetic and household products. Consultant : analysis, control, production, formulation of disinfectants, toilet preparations, cosmetics and perfumes, factory planning and organisation.

Consultant : A. W. Middleton, B.Sc., Ph.D., F.R.I.C., F.C.S.

Number of Qualified Staff : 1.

MIDLAND LABORATORY GUILD (1928) LTD., King Alfred's Place, Broad Street, Birmingham. (Midland 5427).

Field of work, and services offered : Analytical and metallurgical consultants : investigatory work, routine control, etc. on all metals and alloys ; mechanical tests, production development work, etc. The laboratories are not primarily for research but rather for production control and development. Prepared to advise and assist with all metallurgical and inorganic problems.

Scientist in Charge : H. H. Symonds, A.I.M., F.C.S.

REGINALD MILTON, 24, Welbeck Way, London, W.1. (Welbeck 8488).

Field of work, and services offered : Biochemical consultants : food analysis and food formula advisers ; pharmaceutical problems and formula ; water analysis ; specialists in micro-analysis. The laboratory services include advice on all forms of biochemical research. Pathological investigations and bacteriological tests are also carried out. Food analysis, including vitamin assays and advice on food processing and manufacturing problems, is offered.

Consultant : Reginald Milton, B.Sc., F.R.I.C.

Number of Qualified Staff : 2.

BURROWS MOORE, Chestnut Cottage, Lympsham, Weston-super-Mare, Somerset.

Field of work, and services offered : General : chemistry, physics, engineering, chemical engineering. Special : ceramics, fuels, fluid dynamics, heat transmission, plant design, statistics.

Consultant in Charge : Burrows Moore, D.Sc., B.Sc.Eng.(Lond.), A.K.C., Ph.D., M.Sc.Tech.(Manc.), F.R.I.C.

HAROLD MOORE & PARTNERS (ENGINEERS) LTD., Research Laboratories, Godstone Road, Whyteleafe, Surrey. (Upper Warlingham 367).

Field of work, and services offered : Chemical engineers and designers : speciality—the designing of petroleum and coal tar refining equipment.

Consultants : H. Moore, M.Sc.Tech., M.I.Chem.E., F.C.S., F.Inst.Pet., F.Inst.F., H. E. Charlton, F.Inst.Pet., A.M.I.Chem.E., F.A.Inst.Mech.E., M.Inst.F.

Number of Qualified Staff : 3.

MORITZ & FULLER, 42A, Buckingham Palace Road, S.W.1. (Victoria 5803).

Field of work, and services offered : Analytical and consulting chemists : brewing and allied industries ; water examination, chemical and bacteriological ; microbiology as applied to fermentation.

Partners : F. E. B. Moritz ; D. H. F. Fuller ; E. J. Jeffrey, B.Sc.(Lond.), F.R.I.C.

Number of Qualified Staff : 2.

NEWCHEM, LTD., 183, London Road South, Poynton, Cheshire. (Poynton 2776).

Field of work, and services offered : Initiation and control of chemical and allied processes. *Inorganic* : electrochemical problems, metal finishing. *Organic* : estimations and examinations relative to the Food and Drugs Act, bio-chemical assays, vitamin assays, water, sewage and effluents, agricultural analysis. Fully equipped laboratories—examples of specialised instruments in use are : pH meter (latest mains operated temperature compensated type) ; photoelectric absorbtimeter ; diamond hardness tester, (10 k.g. load for determining hardness of surface layers), refractometer, polarimeter, etc. ; high vacuum distillation apparatus ; cathode ray oscilloscope (split-beam).

Director : P. A. Charlesworth, B.Sc.(Hons.), A.R.I.C., A.M.Inst.Pet.

Number of Qualified Staff : 3 (to be increased to 6).

DR. H. ORENSTEIN, 140, Queen's Drive, Glasgow, S.2. (Pollok 3925) and 26, Leadenhall Buildings, Leadenhall Street, London, E.C.3. (Mansion House 7512).

Field of work, and services offered : Management, production, layouts and costing.

Number of Qualified Staff : 6.

ALBERT E. PARKES, 161, Bow Road, London, E.3. (Advance 3301).

Field of work, and services offered : Public analysts : food technologists.

Consultant : Albert E. Parkes, F.R.I.C.

Number of Qualified Staff : 1.

PARRY & FERGUSON, 15, Borough High Street, London, S.E.1. (Hop 3016).

Field of work, and services offered : Consulting and analytical chemists : essential oils and related products ; shellac and lac products ; raw materials and finished products of the food, pharmaceutical and cosmetics industries.

Director : George W. Ferguson, B.Sc., Ph.D.(Lond.), F.R.I.C.

Number of Qualified Staff : 3.

DR. C. A. REDFARN, Quality House, Quality Court, Chancery Lane, London, W.C.2. (Holborn 4207).

Field of work, and services offered : Synthetic resins and plastics : research, development, and advisory service in manufacture.

Director : C. A. Redfarn, B.Sc., Ph.D., F.R.I.C.

Number of Qualified Staff : 4.

REFINERY EQUIPMENT & SPECIALITY CO., LTD., 2, Wellesley Parade, Godstone Road, Whyteleafe, Surrey.

Field of work, and services offered : Chemical engineers and manufacturers of special laboratory equipment, proportioning pumps, petroleum gauging gear, also pilot plants for the petroleum and chemical industries.

Directors : H. Moore, M.Sc.Tech., M.I.Chem.E., F.Inst.Pet., F.Inst.F. A.Inst. Mech.E., F.C.S. and H. E. Charlton, F.Inst.Pet., A.M.I.Chem.E., M.Inst.F.

Number of Qualified Staff : 3.

RESEARCH ENGINEERS, LTD., Northampton Grove, Canonbury, London, N.1. (Canonbury 4244/5 and Clissold 5204).

Field of work, and services offered : Consultant or technical advice on engineering problems ; research on engineering problems ; development of special machinery, new inventions and processes ; design and development work and constructions of prototypes. Fully equipped drawing office and works.

Managing Director : Gavin C. Goodhart.

Number of Qualified Staff : 4.

RIDEAL, RIDEAL & SCIVER, 28, Victoria Street, Westminster, London, S.W.1.

Field of work, and services offered : Consulting chemists, analysts and bacteriologists : bacteriological standardisation of disinfectants ; river pollution and trade effluent treatment problems ; analysis of foods ; testing of sterile solutions for injection.

Director : A. Sciver, B.Sc.(Lond.), F.R.I.C., F.I.S.E. (3 other partners, one a medical man).

Number of Qualified Staff : 6.

RIDSDALE & CO., LTD., 234, Marton Road, Middlesbrough. (Middlesbrough 3973).

Field of work, and services offered : Chemical analysis of metallurgical materials, ferrous and non-ferrous. Research into new quick methods ; metallurgical research on a laboratory scale ; foundry moulding sand testers and consultants.

Director : N. D. Ridsdale, F.I.M., F.R.I.C.

Number of Qualified Staff : 2.

RILEY, HARBORD & LAW, Parliament Mansions, Abbey Orchard Street, Victoria Street, London, S.W.1. (Abbey 3104/3105).

Field of work, and services offered : Testing of cement, concrete and other materials used in building construction ; chemical analysis of metals, minerals, fuels, etc. ; consultants on general metallurgy.

Directors : E. F. Law, A.R.S.M. ; Vernon Harbord, F.R.I.C., A.R.S.M. and J. C. W. Humfrey, O.B.E., M.Sc., M.Eng.B.A.

Number of Qualified Staff : 5.

ROCKLEA LABORATORIES, Church Street, Gildersome, nr. Leeds. (Morley 906).

Field of work, and services offered : Analytical and consulting chemical work relating to the following phases of industrial chemistry : fibres (natural, artificial and synthetic) ; dyeing ; textile and paper colour printing and other colouring processes ; dyes ; pigments ; paints, plastics, cements, and other chemical products used in the building industry and decorative arts.

Director : Ellis Clayton, F.R.I.C.

JOHN L. ROGERS & STAFF, Abbey House, Victoria Street, London, S.W.1. (Abbey 4410).

Field of work, and services offered : Food consultants : general research, product development, factory planning and engineering, factory organisation ; special attention to quick-freezing.

Director : John L. Rogers.

Number of Qualified Staff : 3, covering chemical engineering, chemistry and statistics.

ERNST ROSENTHAL, 246, Park West, Marble Arch, London, W.2. (Paddington 1280 and Regent 0984).

Field of work, and services offered : Industrial research consultant : ceramics, refractories, ceramic condensers, carbon resistors.

Consultant : Ernst Rosenthal, Dr. Ing., A.M.I.E.E.

O. W. ROSKILL, 14, Great College Street, S.W.1. (Whitehall 8272/3/4).

Field of work, and services offered: Industrial consultants: factory construction and reorganisation—location, planning, scheduling of plant and equipment, layout, supervision of tendering and erection; advice on factory and office organisation, including production planning and control systems; preparation of reports on a wide range of industrial-economic subjects, these include market surveys, capital and production cost estimates, development of new products and industrial location in relation to markets, sources of raw material, transport costs, availability of services, etc.

Director: O. W. Roskill, M.A., B.Sc.(Oxon), F.R.I.C., F.Inst.F., M.I.Chem.E., A.I.Mech.E.

Number of Qualified Staff: 17 (partners, senior staff and research assistants).

H. W. ROWELL, 2, Cranbrook Road, Handsworth, Birmingham, 21.

Field of work, and services offered: Specialising on the application and manufacture of all types of plastic; design and building of factories; design and purchase of plastic moulding tools; directing industrial development research.

Consultant: H. W. Rowell, M.I.Chem.E.

RUDDOCK & SHERRATT, 46, Legh Street, Warrington. (Warrington 531).

Field of work, and services offered: Consulting chemists: food, water, industrial water supply.

Director: John Graham Sherratt, B.Sc., F.R.I.C.

Number of Qualified Staff: 3.

C. EDWARD SAGE, 76, Twyford Avenue, London, N.2. (Tudor 4776).

Field of work, and services offered: Analyst and consulting chemist: drugs, fine chemicals and essential oils.

Consultant: C. Edward Sage, F.R.I.C., Ph.C., A.M.I.Chem.E.

SCIENTIFIC & INDUSTRIAL DEVELOPMENTS, LTD., St. Edmunds Institute, Town Mill Brow, Rochdale (Telephone 48047). London Office: 90, Ebury Street, S.W.1. (Sloane 6281-2).

Field of work, and services offered: Research and development in engineering, fine measuring instruments, surface finish instruments, electro-magnetic measuring devices, plastics, chemical engineering, building constructions, lubrication technology, bearing design.

Managing Director: Harry Shaw, A.M.I.P.E., M.S.I.T.

SCOTT, FARNELL & PARTNERS, LTD., 1A, Conduit Road, Plumstead, London, S.E.18. (Woolwich 1158/9).

Field of work, and services offered: Manufacture and refining of cane and beet sugar. Manufacture and application of activated carbon.

Director: R. G. W. Farnell, A.R.C.S., F.R.I.C.

Number of Qualified Staff: 2.

A. B. SEARLE & STAFF, Charlbury, Oxford. (Charlbury 68).

Field of work, and services offered: Advice and tests on clays, limestone and sands and articles and other products made from them, including bricks, tiles, stoneware, furnace linings and other refractory materials, portland and other cements, lime, whitening, silica powders, aggregates, concrete, mortars, scouring powders, fillers, etc. A very important part of the work during the last thirty years has been bringing to the notice of clients the application of the latest results of "pure" research to clients' industrial needs.

Director: A. B. Searle, Ph.D., F.ValuersInst., F.Inst.Arbitrators, F.Inst.Quarrying etc.

THE SHEFFIELD TESTING WORKS, LTD., Blonk Street, Sheffield, 1. (Sheffield 23871).

Field of work, and services offered: Testing (mechanical, physical and chemical) of materials used in engineering, building and other trades. Consultants upon all matters in which the testing, thermal treatment and examination of materials are concerned. Investigation into all forms of mechanical breakdown.

Director and General Manager: G. W. Vickers.

Number of Qualified Staff: 1 (Chief Chemist).

THE SILBERRAD RESEARCH LABORATORIES, Loughton, Essex.
(Loughton 444).

Field of work, and services offered : Consulting work in industrial chemistry.

Director : Dr. O. Silberrad, Ph.D., M.R.S.A., F.C.S., F.S.C.I., etc.

Number of Qualified Staff : Varies with the work.

FELIX SINGER, Keramos House, 46, Castlemaine Avenue, South Croydon Surrey. (Croydon 5217).

Field of work, and services offered : Field : ceramics (pottery and heavy clay works) such as earthenware, porcelain, bone china, steatite, high frequency ceramic bodies, stoneware ; sinter alumina and other vitrified single oxide bodies ; filters for domestic ware, wall and floor tiles, artware ; electrical insulators ; heat, shock resistant kitchen ware, sparking plugs, cutting tools, turbine blades for high tension and high frequency. Services offered : consulting ceramist in all questions concerning the making and improving of ceramic ware ; research and production ; mass production.

Consultant : Felix Singer, Dr.Phil., Dr.-Ing., M.I.Chem.E.

R. CECIL SMART, (Office) 146, High Street, Harborne, Birmingham (Harborne 1157). (Private) 68, Hamilton Avenue, Harborne, Birmingham (Harborne 1744).

Field of work, and services offered : Consulting engineer and economist (industrial research), technologist, valuer and surveyor to offices and government departments, etc. Author of monographs and papers on industry, engineering, industrial fires and explosions, industrial safety and welfare, mining engineering, economic and industrial research. Papers in *Colliery Engineering*, *Colliery Guardian*, *Trans. Inst. Mining Engineers*, *Industrial Power and Mass Production*, *Procs. Nat. Assn. Colliery Managers*, *Fuel Economy Review*, *J. Inst. Mech. Engineers*, *J. South Wales Inst. Engineers*, *J. Coventry Engineering Soc.*

Consultant : R. Cecil Smart, M.C., M.I.Min.E., F.R.Econ.S., A.M.I.Mech.E., M.Amer.I.M.E.

DUNFORD SMITH & MOORE, Swalwell, Newcastle-on-Tyne. (Whickham 87379).

Field of work, and services offered : General analytical and consulting work ; ferrous and non-ferrous metals and alloys ; fuels ; fertilisers and feeding-stuffs ; leathers ; waters, etc.

Consultants : Hugh Dunford Smith, M.Sc., and T. W. Moore, M.A., B.Sc., A.R.I.C.

E. W. SMITH, Higham Cottage, Beech Avenue, Effingham, Surrey. (Bookham 529).

Field of work, and services offered : Technical and administrative advice concerning production and utilisation of fuels.

Consultant : Sir Ernest Smith, C.B.E., D.Sc., F.R.I.C., M.I.Chem.E., M.I.Gas.E., F.Inst.F.

R. H. HARRY STANGER, Broadway House, 24-28, Tothill Street, Westminster, London, S.W.16. (Whitehall 6368).

Field of work, and services offered : Consulting chemists and engineers ; inspecting engineers ; building and engineering materials ; cement, concrete, foundation problems, soil surveys and site investigations ; analytical and mechanical testing, metals, plastics, oils, paints, fuels, textiles.

Director : R. H. Harry Stanger, Assoc.M.Inst.C.E., A.M.I.Mech.E., M.I.Struct.E., F.C.S.

Number of Qualified Staff : 5.

H. J. STERN, The Laboratory, Adie Road, Hammersmith Grove, London, W.6. (Riverside 4342).

Field of work, and services offered : Consulting chemist : rubber, natural and synthetic, including latex, ebonite and gutta percha ; plastics, particularly thermoplastics ; analysis and all aspects of manufacture ; polymerisation ; fabrication. Technical laboratory for rubber and plastics fully equipped with machinery for small scale operation.

Director : H. J. Stern, B.Sc.(Oxon and Liverpool), F.I.R.I., Ph.D.(Liverpool), A.R.I.C.

Number of Qualified Staff : 2.

W. H. STEVENS, Park Farmhouse, Hawthorne Road, Bickley, Kent. (Imperial 3971).

Field of work, and services offered : Consulting chemist : specialist in organic chemical technology. Industries and products covered include : natural and synthetic rubbers (raw rubbers, manufactured products, latex, ebonite, etc.), plastics, synthetic resins and polymers and their chemical intermediates, adhesives, coatings, paper, wood. Research, analysis, testing, development, market research (technical) and patents.

Consultant : W. H. Stevens, A.R.C.S., F.R.I.C.

A. P. SUMMERFIELD, 126, Gough Road, Birmingham, 15. (Calthorpe 2978).

Field of work, and services offered : Consultant to the plastics industry : design of moulds and equipment for the production of articles made of plastic materials. Special preheating ovens, Br. Patent 525261, other patent pending.

Consultant : Arthur P. Summerfield, D.Sc.(Tech.), A.M.I.Mech.E.

G. J. SUTTON, 32, Old Queen Street, Westminster, London, S.W.1.

Field of work, and services offered : Design of special machines and mechanisation of industrial processes.

Consultant : G. J. Sutton, M.I.Mech.E.

JAMES TAYLOR, 6, Idol Lane, Eastcheap, London, E.C.3. (Mansion House 3162).

Field of work : Plastics and their applications.

Consultant : James Taylor, B.Sc., F.R.I.C.

S. M. TRITTON, *see under* GREY OWL

A. J. V. UNDERWOOD, 38, Victoria Street, Westminster, London, S.W.1. (Abbey 2811-2812).

Field of work, and services offered : Consulting chemical engineer.

Consultant : A. J. V. Underwood, D.Sc., M.I.Mech.E., F.R.I.C., M.I.Chem.E., F.Inst.Pet., F.Inst.F.

DR. AUGUSTUS VOELCKER & SONS, Stuart House, 1, Tudor Street, London, E.C.4. (Central 9026).

Field of work, and services offered : Foods and drugs, water and sewage examinations, fertilisers, feeding-stuffs for cattle, soil examinations.

Director : Eric Voelcker, A.R.C.S., F.R.I.C.

WALLACE ATTWOOD, *see under* ATTWOOD.

WALLACE & CLARK, 266, St. Vincent Street, Glasgow, C.2. (Glasgow City 0911).

Field of work, and services offered : Analysis, consulting and research : foods, drugs, pharmaceuticals, waters, effluents. Industrial research and works service.

Director : L. M. Mundy, F.R.I.C., Ph.C.

Number of Qualified Staff : 3.

WATERFALL & O'BRIEN, 4, Queen Square, Bristol, 1. (Bristol 23808).

Field of work, and services offered : Analytical chemists : general chemical analysis specialising in fertilisers, feeding-stuffs, foods, milk, waters and effluents, fuels, oils, lubricants, leather, road materials.

Principal : H. S. Howes, B.Sc., F.R.I.C.

THE WEARMOUTH PLASTICS RESEARCH LABORATORIES, 46, Laughern Road, St. Johns, Worcester. (Worcester 3682).

Field of work, and services offered : All researches in plastics technology and science.

Director : W. G. Wearmouth, B.Sc.Eng., Ph.D., F.Inst.P.

Number of Qualified Staff : 2.

E. J. B. WILLEY, 2, Collingham Place, London, S.W.5. (Fro 2117).

Field of work, services offered : Physical chemistry and physics applied to engineering ; vacuum and compressed air practice, heat treatment of steels ; electronics ; instrument design ; gas catalysis, etc. All kinds of general advisory work.

Consultant : E. J. B. Willey, D.Sc., Ph.D., F.R.I.C., etc.

H. AMPHLETT WILLIAMS, The Laboratory, 1, Southwark Street, London, S.E.1. (Hop. 2864).

Field of work, and services offered : Public analyst : food and drugs analysis ; waters ; fluorine and other poisons.

Director : H. Amphlett Williams, A.C.G.F.C., F.R.I.C., F.C.S.

Number of Qualified Staff : 2.

K. A. WILLIAMS, see E. R. BOLTON.

DAVID WOODROFFE, 23, The Drive, Northampton. (Northampton 4298).

Field of work, and services offered : Leather manufacture, leather dyeing, leather finishing, materials and chemicals.

Director : D. Woodroffe, M.Sc., A.R.I.C.

Number of Qualified Staff : 3.

DR. V. E. YARSLEY, The Laboratory, 1, Ewell House Grove, Ewell, Surrey (Ewell 3947), also at Midland Laboratory, Kelvin Chambers, 24, Lichfield Street, Walsall (Walsall 6383).

Field of work, and services offered : Research and development in plastics, surface finishes, rayon.

Director : V. E. Yarsley, D.Sc.(Zurich), M.Sc., F.R.I.C. *In charge of Walsall Laboratory* : H. Kitchen, Ph.D., A.R.I.C.

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Terms of Reference

To report and recommend upon proposals (i) for instituting specific researches ; (ii) for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries or trades ; (iii) for the establishment and award of research studentships and fellowships.

The Council may itself initiate such proposals and may advise the Committee on such matters, whether general or particular, relating to the advancement of trade and industry by means of scientific research as the Committee may from time to time determine.

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To assist the Government with the many far-reaching questions raised by the new discovery, both as regards its international treatment and its further development in this country, whether for industrial or military purposes.

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(The Cabinet)

Appointed : March 1946

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Terms of Reference

To advise His Majesty's Government on all matters which affect the efficiency and stability of the shipbuilding industry; and in particular to advise on the part which the shipbuilding industry can play in fulfilling the policy of full employment. To advise His Majesty's Government of any steps required to safeguard the war potential of the Industry. To promote the co-operation of the shipbuilding employers both with shipowners and the representatives of the shipyard labour. To advise from time to time on organisation, practice, and cognate matters, with a view to maintaining and improving the efficiency and stability of the industry; and to arrange for such consultation with the industry and for such inquiries into specific matters as may be necessary for this end.

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Secretary: H. A. D. Montmorency, O.B.E.

Terms of Reference

To inquire into the financial needs of university education in Great Britain; to advise the Government as to the application of any grants made by Parliament towards meeting them; to collect, examine and make available information on matters relating to university education at home and abroad; and to assist, in consultation with the universities and other bodies concerned, the preparation and execution of such plans for the development of the universities as may from time to time be required in order to ensure that they are fully adequate to national needs.

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Terms of Reference

To advise the Lord President of the Council in the exercise of his responsibility for the formulation and execution of Government scientific policy.

SCIENTIFIC MAN-POWER COMMITTEE

(Lord President of the Council)

Appointed : December 1945**Chairman :** Sir Alan Barlow, Bart., K.C.B., K.B.E.**Secretary :** M. T. Flett**Terms of Reference**

To consider the policies which should govern the use and development of our scientific man-power and resources during the next ten years and to submit a report on very broad lines at an early date so as to facilitate forward planning in those fields which are dependent upon the use of scientific man-power.

A Report, presented to Parliament in May 1946, states that the problem of scientific man-power during the next decade falls into two parts. The immediate task is to bring back qualified scientists from the Forces to fulfil the needs of reconstruction and to make good the physical damage which war has inflicted on universities and research establishments. The longer term problem is to provide sufficient qualified scientists to meet the nation's requirements, and the Committee stresses the importance of using scientific man-power to the utmost to develop scientific resources.

With reference to the longer term problem, the Committee recommends that the output of scientific graduates from the universities should be doubled to give approximately 5,000 every year, and considers that financial assistance should be extended to ensure that all able students can qualify. The Committee also recommends consideration of the development of a few Institutes of Technology, designed to maintain the highest possible standards of study and research.

Recommendations are made regarding the capacity of the universities to expand. It is thought that there will be sufficient trained students to fill the expanding universities, and proposals are made for securing additional university teachers in sufficient numbers to give individual teachers adequate time for their own research. The establishment of one completely new university should be considered.

It is noted that adequate research facilities are needed in all university science departments, for the benefit of research itself, of the teachers, and for training students in research methods. It is thought that research scientists and the higher grade teachers should have two or three years of post-graduate research training. There should be an expansion in research schools for training purposes apart from the needs of the students, and an increase is recommended in financial grants made specifically towards research by university staffs.

It is stated that in the allocation of the limited supply of scientists during the reconstruction period, the order of preference should be : (1) Teaching and Fundamental Research ; (2) Civil Science, both Government and Industrial ; (3) Defence Science. The attractions of an academic career should be improved. Finally, it is thought that the independence of the universities can be preserved together with the development of a greater degree of co-ordination between university policy and the needs of the country.

Command Paper No. 6824.

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Secretary : J. L. Nayler, National Physical Laboratory

Assistant Secretary : A. C. F. Brown, National Physical Laboratory

Terms of Reference

To advise the Minister responsible on scientific problems relating to aeronautics; to keep under review the progress of Aeronautical Research and to advise the Minister on the programme and the planning of aeronautical research carried out for the Government of the United Kingdom; from time to time, to make recommendations to the Minister on research which the Council considers it desirable to initiate; when requested to do so, to tender advice upon any research carried out by or on behalf of the aeronautical industry; subject to the needs of security, to make the results of British research generally available, by the publication of research reports; to advise upon aeronautical education in the United Kingdom in so far as it is relevant to research; to maintain contact with similar bodies or institutions in the Dominions and foreign countries; to make an annual report to the Minister.

BALL-CLAY INDUSTRY INQUIRY

(Board of Trade)

Appointed : January 1946

Chairman : Professor W. R. Jones, D.Sc., D.I.C., M.I.M.M.

Secretary : T. K. Rees, Board of Trade

Terms of Reference

To undertake a special inquiry into the difficulties affecting the ball-clay industry at the present time, and to report as soon as possible upon the steps which should be taken to increase the production of ball-clay to meet the requirements of the expanding pottery industry—including the manufacture of housing fittings—for which ball-clay is an essential raw material.

A Report, issued in March 1946, deals chiefly with a proposed short-term policy aimed at securing adequate supplies of the white-ware group of clays required for domestic consumption in the immediate future. Speeding up of mechanisation is proposed, especially in the open-cast works. The urgent need for a long-term policy is stressed, to bring the industry into line with modern industrial trends. It is especially important to prove the national resources of ball-clay deposits by a systematic exploration of the areas concerned under the direction of the Geological Survey. The advantages of acquisition by the State of the mineral rights should be considered. The necessity of having sufficient trained technical staff is stressed. It is suggested that expert examination of the types of clays traversed by the boreholes would obviate some wasteful developments which have occurred in the past, and that some co-operative scheme of research should be developed, taking full advantage of facilities already available.

PATENTS AND DESIGNS ACTS COMMITTEE

(Board of Trade)

Appointed : April 1944

Chairman : Kenneth R. Swan

Secretary : H. W. Clarke

Terms of Reference

To consider and report whether any, and if so what, changes are desirable in the Patents and Designs Acts, and in the practice of the Patent Office and the Courts in relation to matters arising therefrom.

To give consideration to, and to submit an interim report on : (a) the initiation, conduct and determination of legal proceedings arising under or out of the Patents and Designs Acts, including the constitution of the appropriate tribunals ; and (b) the provisions of these Acts for the prevention of the abuse of monopoly rights ; and to suggest any amendments of the statutory provisions, or of procedure thereunder, which in our opinion would facilitate the expeditious settlement and the reduction of the cost of legal proceedings in patent cases, and would encourage the use of inventions and the progress of industry and trade.

A first Interim Report was presented to Parliament in April 1945. The Committee is agreed as to the pressing need for a modification of the procedure under which applications are at present made for extension of term of patents in cases where the patentee as such has suffered loss or damage as a result of the war. It recommends (subject to the dissent of two members) that jurisdiction be given to the Comptroller so that a patentee may apply at his option to the Comptroller or to the Court with the right to appeal. The Committee unanimously recommends that it be obligatory only to advertise applications for such extension in the official Journal (*Patents*).

Command Paper No. 6618.

A second Interim Report, presented in April 1946, recommends provision for the grant of licences where a more extended use of a patent could be made, and amendments of the existing provisions to counteract certain restrictive practices. Recommendations also cover registration of patent agreements, the subject matter of patents, appeals from the Comptroller's decisions, reference to prior specifications and trial of patent actions. It is thought that two special judges with technical or scientific qualifications and experienced in patent litigation should be appointed to hear all patent actions ; scientific assistants should be available to assist the judge. The Comptroller should be authorised to try cases of alleged infringement where the parties agree to submit the matters in dispute to his decision.

Command Paper No. 6789.

WORKING COMMITTEE ON CHINA CLAY

(Board of Trade)

Appointed : December 1945

Chairman : Professor W. R. Jones, D.Sc., D.I.C., M.I.M.M.

Secretary : T. K. Rees (Board of Trade)

Terms of Reference

To inquire into the factors affecting the efficiency of the production of china-clay and to report upon the methods which should be adopted to increase production to a degree sufficient to meet the probable post-war requirements at home and abroad.

A Report, presented to Parliament in March 1946, is mainly concerned with the immediate steps necessary to ensure a considerable increase in production. Attention is drawn to the need for a long-term policy, and the Committee recommends the appointment of a Working Party to examine the whole economic structure of the china-clay industry. A long-term policy should provide for increased mechanisation, research facilities available to all producers, and the marketing of the clay.

Command Paper No. 6748.

BOOT AND SHOE WORKING PARTY

(Board of Trade)

Chairman : Sir Thomas P. Bennett, C.B.E., F.R.I.B.A.

Secretary : F. I. Lamb

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvement of organisation, production and distribution methods and processes in the boot and shoe industry, and to report as to the steps which should be adopted in the national interest to strengthen the industry and to render it more stable and more capable of meeting competition in the home and foreign markets.

A Report was published in 1946. In Chapter XI, dealing with Research, it is stated that there has been a history of slow but persistent and successful development. The Working Party recommends that the Research Association should plan its prospective scale of operations upon the basis of an income composed of a subvention of £12,000 from the proposed Shoe Manufacturing Services Board earning D.S.I.R. grant. It is stated that research is needed on a substantial scale into a number of matters, and recommendations are made for expansion of work in the first instance upon measurement of feet, shoe size and fitting markings, grading of lasts, export markets, testing for quality, materials, tests of wearing qualities, design, quality specification and control, repairing methods and shoe manufacturing machinery.

In connection with quality of footwear, the Working Party recommends that the Research Association should re-examine the principles underlying the development of a scheme for controlling quality by means of a hallmark, and should examine the problem of specifying minimum standards for shoemaking materials and components. Continuance of the regulations requiring the stamping of the manufacturer's registered number on every shoe is recommended, together with annual publication of the list of numbers.

With reference to fitting, the Working Party recommends continuance of the work of the Research Association in evolving a method of measurement of feet and in carrying out mass observation of feet to attempt to establish an average relationship between length and fitting; subsequently the investigation should be extended to all the countries to which Great Britain hopes to export shoes. Examination of the scheme for standardising size and fitting markings, recommended in 1937, is proposed to ensure that it conforms to today's conditions.

The establishment of a Shoe Design Centre by the Shoe Manufacturing Services Board is recommended. Its work would include arrangement of exhibitions, work with the Research Association, development of appropriate designs for use with new materials, and the conduct of research into consumer needs and tastes in the home and leading export markets.

COTTON WORKING PARTY

(Board of Trade)

Appointed : October 1945

Chairman : Sir George Schuster, K.C.S.I., K.C.M.G., C.B.E., M.C.

Secretary : G. J. Macmahon

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvements of organisation, production and distribution methods and processes in the Cotton Industry, and to report as to the steps which should be adopted in the national interest to strengthen the industry and to render it more stable and more capable of meeting competition in the home and foreign markets.

The Report, issued in 1946, in the chapter dealing with Science and Industrial Progress, states that there is a clear need for better and speedier methods of translating research results to large scale production ; this may be met by increasing the proportion of men with good scientific training in the employment of the industry, and by the more frequent use of conferences organised by the Shirley Institute, the Textile Institute, the Society of Dyers and Colourists or other learned societies. It is emphasised that the industry must be ready to make use of scientific method in the study of its practical problems, to encourage the pursuit of scientific knowledge for its own sake in the universities and elsewhere, and to be able to apply scientific knowledge to the improvements of its own production methods.

With reference to the supply of qualified men, it is stated that the industry should encourage and assist financially and otherwise the maintenance in universities and other teaching institutions of strong and active research schools dealing with textile science and textile technology and the fundamental scientific background of the textile industries ; the appropriate research schools should accept selected science graduates for training in textile research for periods of one to three years. In this connection also, the work of the professional and scientific societies should be encouraged and assisted, and consideration should be given to the establishment of industrial research fellowships and associateships, the holders of which would be available for investigating specific problems. Firms should encourage and permit the publication of original research work in scientific journals. It is suggested that the Ministry of Labour should regard genuine training within the universities in textile science and related branches of pure science as a form of national service.

In order to co-ordinate research work, proposals are made for the establishment of a Textile Research Advisory Council for all textile industries, to act in an advisory capacity to review, expand and co-ordinate research and development throughout the textile industries. It is also proposed that a review should be made of the experience over the whole range of industry of the results attained hitherto by Joint Industrial Research Associations ; it is thought that, in the case of the textile industry, correlation between the work of the Central Research Institution and of individual firms would be facilitated by the operation of the proposed Textile Research Advisory Council. The Working Party also recommends a great increase in the total research effort of the industry, by active participation in research on the part of a larger number of firms, and by closer co-ordination of research effort between the different sections of the industry in the drive for new developments ; every individual firm which is large enough should establish a research unit for the investigation of its own ideas, and the development of new processes and new products, while ingenuity and enterprise should be directed towards new inventions.

It is stated that the aims of the Textile Research Advisory Council should be to increase the use of scientific methods in the industry, to foster research, to foster the work of any other organisation or group whose aim is scientific and technical advancement of the industry, and to bring about a general strategy of textile research on a broad basis, leaving tactics to the various research laboratories. Its principal functions would be to follow the course of research and development in every field of textile endeavour ; to explore research activities within the British textile industries and institutions ; to

advise on the deployment of the resources of modern science and the available scientific manpower for the benefit of the industry ; to advise the industries on the co-ordination and integration of existing researches with regard to different fibres and processes ; to suggest measures for fostering research in every phase of textile production ; and to advise on the allocation of funds available for textile research, the administration of textile research fellowships and the exploitation of inventions from non-profit organisations.

FURNITURE WORKING PARTY

(Board of Trade)

Appointed : October 1945

Chairman : A Dagleish

Secretary : Miss M. E. Strudwick

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvement of organisation, production and distribution methods and processes in the furniture industry, and to report as to the steps which should be taken in the national interest to strengthen the industry and render it more stable and more capable of meeting competition in the home and foreign markets.

The Report, submitted in August 1946, deals with technical research in Chapter IX. This recommends the establishment of a Research Association on the basis of subscriptions from the trade, supplemented by Government grant. Its functions would be to formulate the industry's research problems and to place the work with outside organisations or in its own laboratory ; to bring to the whole of the industry the results of such research work ; to extract and circulate, from published material, research matters of interest to the industry ; and to be responsible for the running of the independent testing stations associated with the performance standards scheme. It is thought that woodworking machinery firms should be represented in the Research Association.

The Working Party recommends that individual firms should, wherever possible, set up their own research units.

It is thought that the industry should take greater advantage of the research facilities available at the Forest Products Research Laboratory at Princes Risborough. The Government should keep under review the adequacy of the facilities available at the Laboratory.

Finally, it is thought that more use should be made of the trade press for publishing articles on technical research matters, and the Research Association, in particular, should seek the co-operation of the trade papers, and present the information intelligibly to the layman.

HOSIERY WORKING PARTY

(Board of Trade)

Appointed : November 1945

Chairman : Miss Caroline Haslett, C.B.E.

Secretary : J. Wright

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvements of organisation, production and distribution methods and processes in the Hosiery Industry, and to report as to the steps which should be adopted in the national interest to strengthen the industry and render it more stable and more capable of meeting competition in the home and foreign markets.

A Report was presented in June 1946, recommending the establishment of a Hosiery and Knitwear Council to act in an advisory and consultative

capacity, both to the Government and Industry, on matters of broad policy.

In Chapter XI, dealing with Research, it is stated that the Working Party has surveyed the various sections of the industry and has noted some of the matters calling for research, stating that there is no section of the industry or aspect which does not show opportunities for investigation. Attention is confined to physical research, but it is suggested that the Hosiery and Knitwear Council should consider the establishment of some organisation responsible for research in the economic and sociological fields.

Research is stated to be valuable to the hosiery industry mainly to the extent that its results lead to the production of knitted goods of new or improved types or having new qualities. Fullest co-operation with research establishments of the cotton and woollen industries and of other industries concerned with the production of yarn is necessary.

The Working Party strongly commends the establishment of the Hosiery Research Council (1945), and recommends development of the Wool Industries Research Association Station at Thorneywood House, Nottingham, into a Hosiery Research Institute. It is suggested that the Council should represent a wider range of interests, including representatives of D.S.I.R. and other scientists. Primary responsibility for the establishment of a research service should rest with the Hosiery and Knitwear Council, while the Hosiery Research Council should appoint a Director of Research and should be responsible for the establishment of a Hosiery Design Centre.

It is proposed that part of the cost should be met by D.S.I.R. grant, and part by a compulsory levy on all hosiery manufacturers in accordance with the amount of yarn used. The Government is recommended to take steps to inquire into the incidence of levies actual and proposed.

It is recommended that the Hosiery and Knitwear Council should consider ways and means by which the various textile industries might be brought into consultation, with the object of establishing some form of general textile research organisation.

The Working Party strongly advocates that the Hosiery Research Council and Institute should establish close liaison with the universities, technical colleges, textile and other professional and scientific institutes, other research associations and state research organisations. Finally, it recommends development of an efficient industrial relations service to ensure the widest dissemination of research findings amongst the industrialists who are expected to apply and develop them.

POTTERY WORKING PARTY (Board of Trade)

Appointed : October 1945

Chairman : M. Watkins

Secretary : A. E. Percival

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvement of organisation, production and distribution methods and processes in the pottery industry, and to report as to the steps which should be taken in the national interest to strengthen the industry and render it more stable and more capable of meeting competition in the home and foreign markets.

In a Report, presented in April 1946, the Working Party states its belief that the greatest return in industrial efficiency is obtained from expenditure on his own research department by the individual manufacturer. Larger

factories should create research departments with well-trained scientific staff, while small ones should consider employment of at least one scientist. The industry as a whole is stated to be inadequately equipped with research staff, while the liaison between the present Research Association and the industry leaves much to be desired.

It is proposed that the Research Association should examine traditional methods and draw up sets of specifications that correspond to genuine differences in the qualities of raw materials.

The income of the Research Association (established in 1937), now £44,000 per year, is regarded as fully adequate for the present needs of the industry. Its most suitable function is stated to be opening up the fundamental scientific background of the pottery industry, while day-to-day problems requiring investigation are the function of the technical manager or research staff of the factory itself. The Association is strongly advised to consider splitting the contributions of members into two parts, one of which would be used to support fundamental research, and the other to finance a co-operative technical consulting service; membership of the latter would be voluntary, and would not necessarily be taken up by firms employing their own research staff.

The Research Council should be responsible for deciding what researches are to be carried out by the Director, while the latter should be able to contribute sound advice, and should have a large degree of freedom. The Director must bear the full responsibility for the effectiveness of work carried out by the research staff, and should be able to advise on the programme of research. Liaison between the industry and the Research Association should be improved, and the Director should see that the results of the work are transmitted in a form intelligible to the common man. A senior official from the Board of Trade should be a member of the Council.

Imposition of a compulsory levy for co-operative fundamental research on firms with a turnover of more than £40,000 is recommended.

JEWELLERY AND SILVERWARE WORKING PARTY (Board of Trade)

Appointed : March 1946

Chairman : C. R. Morris

Secretary : W. O. Newsam

Terms of Reference

To examine and inquire into the various schemes and suggestions put forward for improvement of organisation, production and distribution methods and processes in the jewellery and silverware industry, and to report as to the steps which should be taken in the national interest to strengthen the industry and render it more stable and more capable of meeting competition in the home and foreign markets.

In connection with design and research, the Report, published in 1946, recommends that the industry should take steps to increase the financial resources of the proposed Design and Research Centre, to enable it to develop quickly its facilities for giving the proposed services.

It is intended that this Centre shall devote about half its resources to scientific and technical research. Its main aims are : research for improvements in metals and other materials capable of being applied in the industry ; the study and development of manufacturing processes ; the introduction of new methods ; and the prompt collection of relevant information on new scientific and technical developments at home and abroad.

The scientific problems will be selected by the Research Committee,

representing both the industry and scientific workers. Subjects for research are proposed.

An important function of the Committees should be close liaison with the Design Section, to ensure that designers are kept more fully informed of the working properties of all materials and the availability of new materials and processes of treatment. The D.S.I.R. has promised full co-operation and support, and substantial financial assistance.

It is felt that the Research section needs two divisions, one for the collection and dissemination of information, and the other for the investigation of scientific problems. The Information Division ought to provide its service first and foremost for the Federation or Association which the Working Party recommends the industry to set up, and ultimately it should play a prominent part in bridging the gap between scientific experiment and industrial processes. The Scientific Investigation Division should handle all fundamental questions arising out of changes in productive processes; conduct experiments on its own initiative; and investigate specific problems referred to it by individual firms. It should co-operate with universities and technical colleges, and other research associations.

The Centre should work in close collaboration with the proposed Production Efficiency Organisation.

The Report also recommends that the industry should take all possible steps to induce firms to give skilled workers of outstanding gifts opportunities to enjoy full training as designers, and to offer employment to fully qualified designers, so as to attract those of high artistic capacity. The industry should also secure the services of a proportion of men and women with good scientific education and some technical training.

COLONIAL RESEARCH COMMITTEE

(Colonial Office)

Chairman : The Lord Hailey, G.C.S.I., G.C.M.G., G.C.I.E.

Members : Sir Edward Appleton, K.C.B., D.Sc., F.R.S.; Sir Alexander M. Carr-Saunders, M.A., LL.D.; Sir T. David Chadwick, K.C.M.G., C.S.I., C.I.E.; Sir Edward Mellanby, K.C.B., M.D., D.Sc., F.R.C.P., F.R.S.; Brig.-Gen. Sir Harold Hartley, C.B.E., M.C., F.R.S.; Sir John C. F. Fryer, O.B.E., M.A.; Professor Arnold Plant, B.Sc.; Dr. A. I. Richards

Secretary : C. Y. Carstairs

Terms of Reference

To advise the Secretary of State on the expenditure of the sums provided for research, by the Colonial Development and Welfare Act 1940, and to assist in the co-ordination of the whole range of research in Colonial studies, irrespective of the provenance of funds.

A Progress Report was published for 1942-43 (Cmd. Paper No. 6486).

COCOA RESEARCH CONFERENCE May-June 1945

(Colonial Office)

Chairman : The Duke of Devonshire, K.G., M.B.E. (Parliamentary Under-Secretary of State for the Colonies)

Secretary : Dr. H. W. Jack, O.B.E. (Assistant Agricultural Adviser, Colonial Office)

Terms of Reference

To examine the whole field of research in cocoa, having regard to the increasing demand for the product, and the fact that available sources of supply were declining.

In a Report issued in 1945, it is thought that the successful organisation of cocoa research is dependent on a proper allocation of functions.

Fundamental cocoa research work should be carried out primarily at two central cocoa research institutes, one in West Africa and one in the West Indies. Certain specialised parts of the fundamental work should be carried out in research institutes in the United Kingdom and the Colonial Empire which specialise in particular branches of science. Research into utilisation of the cocoa bean should be carried out primarily by the research institutions of the chocolate and allied trades industry and in industrial laboratories.

Recommendations are made as to the main lines of research and the proposed distribution between the various organisations regarding such subjects as varieties of cocoa, propagation, breeding, optimum length of life, soils, climatic conditions, physiological research, grower problems, systems of agriculture, cultural problems, pests and diseases, processing, storage and quality, and establishment of research institutes.

It is thought that general co-ordination of all branches of cocoa research work in the British Empire should be the responsibility of the Cocoa Research Committee in London, but there should also be close co-operation and continuous communication between individual institutes and workers in all branches of the work. The Conference also recommends free interchange of ideas and information between British and foreign research workers, and the establishment of contact between the British research institutes and the research organisations of the cocoa and chocolate industry in important foreign consuming countries, especially the United States of America.

Full and early publication of results of cocoa research is felt to be important. Results of research work should be communicated to producers by the Agricultural Departments of the cocoa-producing colonies.

Colonial No. 192.

AERO TYRE ADVISORY COMMITTEE

(Ministry of Aircraft Production*)

Appointed : November 1944

Chairman : H. Grinstead, Ministry of Supply

Members : Representatives of the Air Ministry ; Admiralty ; Ministry of Supply ; Goodyear Tyre & Rubber Co. (Great Britain), Ltd. ; Palmer Tyre, Ltd. ; Firestone Tyre & Rubber Co., Ltd. ; Dunlop Rubber Co., Ltd.

Secretary : J. E. Lloyd, Ministry of Supply

Terms of Reference

To advise on : Suitable standards for wheel rim and tyre dimensions ; any proposals submitted with regard to the construction of tyres ; defects or failures of an epidemic character ; alterations necessary to meet changes in conditions of use ; points of general interest.

BOUNDARY LAYER CONTROL COMMITTEE

(Ministry of Aircraft Production*)

Appointed : March 1946

Chairman : H. M. Garner, Ministry of Supply

Members : Representatives of the Department of Scientific and Industrial Research (National Physical Laboratory) ; Rolls-Royce ; Armstrong-Whitworth ; Ministry of Supply

Independent Members : Sir Melvill Jones (Cambridge University) ; R. McKinnon Wood ; E. F. Relf (College of Aeronautics) ; Professor S. Goldstein (Manchester University)

Secretary : H. F. Vessey (Ministry of Supply)

* Now incorporated with the Ministry of Supply.

Terms of Reference

To advise on the application of boundary layer control devices to aircraft. Suction and blowing will be considered for reduction of drag, increase of lift and provision of control.

HIGH TEMPERATURE MATERIALS RESEARCH COMMITTEE
(Ministry of Aircraft Production*)

Appointed : August 1941

Chairman : Group Captain G. E. Watt, D.D.T.E. (Ministry of Supply)

Members : Representatives of Metropolitan Vickers ; Mond Nickel Co. ; William Jessop & Sons, Ltd. ; Brown Firth Research Laboratories ; Department of Scientific and Industrial Research (National Physical Laboratory) ; Admiralty ; Ministry of Supply

Secretary : R. P. Lister (Ministry of Supply)

Terms of Reference

(a) To gain research information on strength, and general properties of materials for use at high temperature ; (b) to consider the requirements for these materials and the extent to which research meets them.

FUEL AND POWER ADVISORY COUNCIL
(Minister of Fuel and Power)

Chairman : Sir Ernest Simon, LL.D., M.Inst.C.E., M.I.Mech.E.

Members : Geoffrey Crowther ; Sir John Greenly, K.C.M.G., C.B.E., M.I.Mech.E., M.I.E.I., F.Inst.F. ; Dr. E. S. Grumell, C.B.E., M.I.Min.E. ; Sir Harold Hartley, K.C.V.O., C.B.E., M.C., F.R.S. ; Professor C. N. Hinshelwood, F.R.S. ; Professor John Jewkes, C.B.E. ; Professor James Mackintosh, M.D., F.R.C.P., D.P.H. ; Viscount Ridley, C.B.E. ; Sir Robert Robinson, F.R.S., F.R.I.C. ; Geoffrey Summers, C.B.E.

Secretary : R. E. L. Cleaver

Assessors : P. Chantler (Economic Section, Cabinet Office) ; Dr. A. Parker, F.R.I.C., M.I.Chem.E. (Director of Fuel Research, D.S.I.R.) ; R. N. Quirk (Ministry of Fuel and Power) ; Sir Reginald Stradling, C.B., M.C., F.R.S. (Chief Scientific Adviser, Ministry of Works)

Terms of Reference

To consider and advise upon questions referred to it from time to time by the Minister concerning the development and utilisation of the fuel and power resources of the country in the national interest.

A Report *Domestic Fuel Policy* was presented to Parliament in March 1946 on the first reference : " To consider and advise on the use of fuels and the provision of heat services in domestic and similar premises, in the interests of the occupants and of the nation, with special regard to the efficient use of fuel resources and to the prevention of atmospheric pollution."

In the chapter dealing with Research, it is stated that research in relation to domestic heating has been carried out by organisations including D.S.I.R., the gas industry, the electricity industry, manufacturers of appliances for using solid fuel, gas and electricity, and the coal industry and combustion appliance manufacturers. The Government has given financial and scientific and technical assistance to the co-operative research organisations, and effective co-operation of the various research organisations is encouraged by the Consultative Conference on Fuel Research (established in 1943 by D.S.I.R.).

It is stated that expansion of the research and development work is urgently necessary in the next few years if the programme for adequate, efficient, economical and smokeless domestic heating is to be successful.

In connection with fuels, research and development work is necessary in

* Now incorporated with the Ministry of Supply.

relation to improved methods of cleaning coals, development of economical methods of producing coke and smokeless briquettes, improved methods of breaking and size-grading coals and cokes, and conversion of fine coal and coke into smokeless briquettes.

It is necessary to develop for space-heating, water-heating and cooking, improved solid fuel appliances of high efficiency and of pleasing appearance, which are easy to produce and install at reasonable cost. These should be simple to operate, suitable for use with several types of solid fuel and should produce little or no smoke.

Research and development work is also needed to improve the construction of houses and the installation of heating equipment so as to reduce the loss of heat to the atmosphere and to provide adequate ventilation and good conditions of comfort.

It is also recommended that the Government should undertake sociological investigations into the modes of living of different families in houses of different design and with different combinations of heating appliances.

The Council considers that the researches of private enterprise should be co-ordinated as far as possible with the longer range work of the Government Research Stations and the Research Associations. Cmd. 6762.

COMMITTEE OF INQUIRY INTO THE GAS INDUSTRY

(Ministry of Fuel and Power)

Appointed : June 1944

Chairman : Geoffrey Heyworth

Secretary : A. F. James

Terms of Reference

To review the structure and organisation of the Gas Industry, to advise what changes have now become necessary in order to develop and cheapen gas supplies to all types of consumers, and to make recommendations.

The Report *The Gas Industry*, presented in December 1945, includes an historical survey of the gas industry, an examination of the structure and state of the industry today, an examination of the adequacy of the existing statutory requirements in regard to gas quality and the sale of gas by meter, an analysis of the factors affecting the future of the industry, and proposals for a new structure.

It is stated that the present organisation of research within the industry provides for a central Gas Research Board, aiming at "the formation of a co-operative scheme to strengthen the scientific basis of the industry, both by the acquisition of new knowledge and by promoting the utilisation of existing knowledge". In addition several of the larger undertakings have set up research departments, while the plant and appliance manufacturers carry out investigations into their own problems.

The Committee states that the gas industry must depend for its prosperity upon a sustained effort to improve plant and processes and to evolve new and more efficient methods of gas utilisation; therefore well organised research on an adequate scale in many fields must form an important adjunct to its activities. It is recommended that the main effort should be concentrated in an enlargement of the scope and activities of the Gas Research Board, and that powers should be given to the proposed Regional Boards to provide funds by a levy on gas sales. A first objective of £200,000 per annum spent on research should be envisaged.

It is recommended that the Director in charge of either production or

distribution should be responsible for co-ordination between the Boards and the central research establishment. It is thought that each Regional Board could usefully devote attention to technological research and development, but on the other hand the stimulating effect of original research in engendering an enterprising and adventurous spirit in undertakings must be recognised, and in this connection the scope of technological research should be interpreted in the broadest sense.

Command Paper No. 6699.

FUEL EFFICIENCY COMMITTEE

(Ministry of Fuel and Power)

Appointed : September 1941

Chairman : Dr. E. S. Grummell

Secretary : G. H. S. du Pontet

Terms of Reference

To review the recommendations of the 1940 Committee on the use of fuel and to report on immediate measures of economy and to supervise their execution, and especially to ensure that the work of the Departments' Combustion Engineers help to secure the most effective utilisation of the fuel available.

SCOTTISH FUEL EFFICIENCY COMMITTEE

(Ministry of Fuel and Power)

Appointed : September 1942

Chairman : Sir Patrick Dollan, LL.D., D.L., J.P.

Secretary : J. Edward

Terms of Reference

The Scottish Fuel Efficiency Committee is a Regional Committee of the Fuel Efficiency Committee and its terms of reference are the same.

MINERAL DEVELOPMENT COMMITTEE

(Ministry of Fuel and Power)

Appointed : 1946

Chairman : The Right Hon. Lord Westwood, O.B.E.

Secretary : W. C. C. Rose, M.Sc., M.Inst.M.M.

Terms of Reference

To inquire into the resources of minerals in the United Kingdom, excepting coal, oil, bedded ironstone, and substances of widespread occurrence; to consider possibilities and means of their co-ordinated, orderly and economic development in the national interest, and to make recommendations in regard thereto.

TELEVISION ADVISORY COMMITTEE

(Ministry of Information*)

Appointed : 1945

Chairman : G. M. Garro-Jones

Members : R. J. P. Harvey (Treasury); Col. Sir Stanley Angwin and H. Townshend (G.P.O.); H. A. Binney (Board of Trade); E. B. Bowyer (Ministry of Supply); Sir Edward Appleton and O. F. Brown (D.S.I.R.); E. St. J. Bamford and H. G. G. Welch (Ministry of Information*); W. J. Haley and Sir Noel Ashbridge (B.B.C.)

Acting Secretaries : G. Kirk (Ministry of Information*); H. D. Bickley (G.P.O.)

Terms of Reference

To advise the responsible Minister on television policy with particular reference to the following points : (a) The planning, after consultation with industry, of the future television service, including the standards to be adopted; (b) the co-ordination and, where necessary, the initiation of research into the principles and practice of television; (c) the encouragement of pooling of television patents and their use in the national interest; and (d) the investigation of all developments on television at home and abroad, including its use for cinemas, bearing in mind the importance of the export trade and the desirability of the adoption of international television standards.

* Now the Central Office of Information.

ENGINEERING ADVISORY COUNCIL (Ministry of Supply)

Appointed : December 1946

Chairman : The Right Hon. John Wilmot, Minister of Supply

Members : *Representing the Employers*—G. Darnley-Smith ; Lord Davidson ; C. K. F. Hague ; G. S. Maginness ; Sir Robert Micklem ; Sir Harry Railing ; Sir Alexander Ramsey ; Colonel H. Riggall ; Sir William Rootes ; Mark H. Taylor ; W. R. Verdon Smith

Representing the Trade Unions—W. B. Beard ; H. G. Brotherton ; F. Foulkes ; G. Gardner ; H. N. Harrison ; Sir Mark Hodgson ; Gavin Martin ; H. R. Nicholas ; J. R. Scott ; J. W. Stephenson ; J. Tanner

Secretary : W. G. Downey (Ministry of Supply)

Terms of Reference

To provide for the Minister of Supply in the discharge of his responsibilities for the engineering industry, a means of consultation with employers and workers in the industry on matters of general concern in the engineering field.

GAUGE AND TOOL ADVISORY COUNCIL (Ministry of Supply)

Appointed : December 1946

Chairman : Sir Charles McLaren, K.C.B., Director-General of Ordnance Factories.

Members : *Representing the Gauge and Tool Industry*—The Hon. R. A. Balfour (Assistant Managing Director of Messrs. Arthur Balfour & Co., Ltd.) ; A. Bell (Hon. Treasurer of the Gauge & Toolmakers' Association) ; A. Dormer (Joint Managing Director of The Sheffield Twist Drill & Steel Co., Ltd.) ; F. W. Halliwell (Chairman of Messrs. Arnott & Harrison, Ltd.) ; S. J. Harley (Managing Director of the Coventry Gauge & Tool Co., Ltd.) ; H. S. Holden (Managing Director of Messrs. Brooke Tool Manufacturing Co.) ; A. E. Morrison (Managing Director of Messrs. Moore & Wright, Ltd.) ; S. W. Rawson (Sales Director of Messrs. Thomas Firth & John Brown, Ltd.) ; Major-General E. P. Readman, C.B.E., T.D. (Special Director of the English Steel Corporation, Ltd.)

Independent Members : H. N. Harrison, O.B.E. (National Industrial Officer of the National Union of General and Municipal Workers) ; B. C. Wetsall, C.B.E. (Chairman and Managing Director of Messrs. Thomas De La Rue & Co., Ltd.) ; V. E. Wymans (Regional Officer for No. 7 Executive Division of the Amalgamated Engineering Union)

Government Representatives

Ministry of Supply : E. B. Bowyer (Under Secretary (E)) ; G. W. Blackshaw (Assistant Secretary/E.6.)

Department of Scientific and Industrial Research : F. H. Rolt (Superintendent Metrology Division, National Physical Laboratory)

Board of Trade : W. G. Onslow (AS/Industries and Manufacturers (Priorities) Division)

Admiralty : W. E. Bow ; Captain Pears

Secretary : Miss I. M. King (Ministry of Supply)

Terms of Reference

The Gauge and Tool Advisory Council is concerned with gauges, cutting tools, jigs and fixtures and engineers' measuring instruments. It is the duty of the Council to advise on measures for promoting a United Kingdom gauge and tool industry capable of making the maximum contribution to industrial efficiency, exports and security. The Council will provide a means of regular contact between the gauge and tool industry and the Government and will, among other things, consider such subjects as : The collection and dissemination of statistics and information ; production ; exports ; imports ; research and development ; consultation with engineering industries in the planning of new production involving a demand for gauges and tools ; the arrangements for the disposal of Government-owned gauges and tools ; the whole question of essential gauges and tools of which the production in the United Kingdom is either non-existent or unduly limited.

MACHINE TOOL ADVISORY COUNCIL (Ministry of Supply)

Appointed : April 1946

Chairman : Engineer Vice-Admiral Sir Harold A. Brown.

Members : W. P. Eastwood (Chairman and Managing Director, George Swift & Sons, Ltd.); H. W. L. Kearns, C.B.E. (Chairman and Managing Director, H. W. Kearns & Co., Ltd.); G. S. Maginness (Chairman and Managing Director, Churchill Machine Tool Co., Ltd.); R. D. G. Ryder (Thomas Ryder & Son, Ltd.); J. H. Goddard (Chairman and Governing Director, Wadkin, Ltd.); J. B. S. Gabriel (Chairman, Charles Churchill, Ltd.); W. G. Bass (Director, Ferranti, Ltd.); Isaac Hayward, J.P., L.C.C. (General Secretary, National Union of Engineers, Firemen, Mechanics and Electrical Workers); Official representatives from the Admiralty, Board of Trade and Ministry of Supply

Joint Secretaries : C. W. Holt (Ministry of Supply); W. J. Morgan, M.B.E. (Secretary of the Machine Tool Trades Association)

Terms of Reference

To provide a means of regular consultation between the Government and the machine tool industry on matters concerned with metal machine tools, woodworking machine tools and testing machines.

NATIONAL ADVISORY COUNCIL FOR THE MOTOR MANUFACTURING INDUSTRY (Ministry of Supply)

Appointed : April 1946

Chairman : Sir G. W. Turner, K.B.E., C.B. (Ministry of Supply)

Members : Sir Reginald Rootes (President of the Society of Motor Manufacturers and Traders); Sir Miles Thomas, D.F.C. (Vice-Chairman of the Nuffield Organisation); L. P. Lord (Chairman and Managing Director of the Austin Motor Co., Ltd.); S. B. Wilks (Managing Director of the Rover Company, Ltd.); R. F. Fryars (Secretary and Treasurer of the Associated Equipment Co., Ltd.); Sir Charles J. Bartlett (Managing Director of Vauxhall Motors, Ltd.); Sir Peter F. Bennett, O.B.E., J.P., M.P. (Chairman and Joint Managing Director of Joseph Lucas, Ltd.); W. R. Black (Managing Director of Park Royal Coachworks, Ltd.); H. Halliwell, H. B. Brotherton (alternate) (Confederation of Shipbuilding and Engineering Unions); R. Openshaw, W. H. Stokes (alternate) (Amalgamated Engineering Union); G. Wansbrough; E. B. Bowyer (Ministry of Supply); W. G. Onslow (Board of Trade); C. A. Birtchnell (Ministry of Transport)

Secretaries : C. Bennett (Ministry of Supply); R. Gresham Cooke, M.A. (Society of Motor Manufacturers and Traders)

Terms of Reference

To provide a means of regular consultation between the Government and the motor manufacturers on such matters as the location of industry, exports, imports, research, design and technical development, production methods and the general progress of the industry.

COMMITTEE ON THE STANDARDISATION OF ELECTRICAL CABLES AND WIRES FOR GOVERNMENT SERVICES (Ministry of Supply)

Appointed : January 1940

Chairman : Lt.-Col. R. C. Intrall (Ministry of Supply)

Members : Representatives of the British Standards Institution; Cable Makers Association; Railway Executive Committee; Independent Cable Makers Association; Cable Makers (W.E.) Technical Committee; Admiralty; Air Ministry; Electricity Commission; War Office; Ministry of Supply

Secretary : H. J. Dolton (G.P.O.)

Terms of Reference

To prepare and/or amend standard specifications of electrical cables and wires for all purposes, which are in common demand by Government Departments, with a view to economy and to the advantages resulting from inter-changeability and simplification of manufacture.

COMMITTEE OF INQUIRY INTO TEXTILE MACHINERY INDUSTRY (Ministry of Supply)

Appointed : June 1946

Chairman : Mr. Justice Evershed

Members : F. E. Board, F.C.A. (Member of the firm of Cobden Board & Co., Chartered Accountants of Sheffield); W. D'Arcy Madden, M.I.E.E., M.I.Mech.E. (Chairman and Managing Director of Hick, Hargreaves & Co., Ltd., Engineers of Bolton); W. H. Green, J.P. (Member of the London County Council); W. N. Robinson (Ministry of Supply)

Secretary : J. Douglas (Ministry of Supply)

Terms of Reference

To investigate on behalf of the Minister of Supply and report on those matters connected with the manufacture and supply of textile machinery to the Cotton industry recommended for immediate investigation in the Report of the Cotton Industry Working Party.

DIE CASTING ADVISORY COMMITTEE (Ministry of Supply)

Appointed : May 1944

Chairman : To be appointed

Vice-Chairman : Col. J. D. Paxton-Petty (Ministry of Supply)

Members : Representatives of the Board of Trade; Admiralty; General Post Office; Ministry of Works; Zinc Alloy Diecasters Association; Light Metal Founders Association; Bronze and Brass Founders Association; Hoover, Ltd.; Imperial Smelting Corporation; Wolverhampton Diecasting Co.

Secretary : J. J. Lowe (Ministry of Supply)

Terms of Reference

To promote the maintenance of a high standard of quality of all diecastings for Government and essential national requirements; to consider new and extended applications of diecastings for such requirements where desirable on technical, production or labour grounds; to advise the Ministry of Supply and all interested parties on all matters arising out of quality and application; to provide a consultative and advisory service for the interested Government Departments and for industry.

INTER-DEPARTMENTAL COMMITTEE ON THE SCIENTIFIC INSTRUMENT INDUSTRY (Ministry of Supply)

Appointed : January 1946

Chairman : Lt.-General Wrisberg, C.B., C.B.E.

Members : Two representatives of the Industry who, at present, are J. E. C. Bailey (President of the Scientific Instrument Manufacturers' Association of Great Britain); A. J. Philpot (Director of the British Scientific Instrument Research Association) and representatives of the Admiralty; Department of Scientific and Industrial Research; Ministry of Education; Medical Research Council; Agricultural Research Council; Board of Trade; Ministry of Supply

Secretary : M. J. Marshall (Ministry of Supply)

Terms of Reference

To keep under constant review the Government policy towards the Scientific Instrument Industry and to decide, in principle, and on the advice of the appropriate Production Authority, what sections of the Industry from time to time require special development and support.

METAL FINISHING COMMITTEE (Ministry of Supply)

Appointed : February 1946

Chairman : A. W. Hothersall (A.R.D. Ministry of Supply)

Members : Representatives of the British Non-Ferrous Metals Research Association; British Iron and Steel Research Association; Design and Research Centre of the Goldsmiths, Silversmiths and Allied Industries; Department of Scientific and Industrial Research; Ministry of Works; Admiralty; Ministry of Supply

Secretary : L. W. Owens (A.R.D. Ministry of Supply)

Terms of Reference

To afford to any Government Department, or where in the public interest, to any other body, guidance and help on metal finishing and electrodeposition generally in the following ways : (1) Co-ordination and preparation of technical information for general distribution to firms or Government Departments ; (2) answers to technical inquiries on general difficulties or on new problems : investigation or demonstration as necessary ; (3) advice on design and operation of plants for heavy nickel or hard chrome deposition as required ; (4) inspection of suitability of firms for carrying out heavy nickel or hard chrome deposition, or other electrodeposition or metal finishing processes for Government Departments ; (5) survey of research on metal finishing in the United Kingdom and facilities of co-operation between different laboratories engaged on this work.

SCIENTIFIC ADVISORY COMMITTEE

(Ministry of Works)

Appointed : May 1945

Chairman : Professor J. D. Bernal, F.R.S.

Members : Professor P. M. S. Blackett, F.R.S. ; Sir Lawrence Bragg, O.B.E., M.C., D.Sc., F.R.S. ; Professor H. V. A. Briscoe, D.Sc. ; D. N. Chester ; Professor W. E. Curtis, D.Sc., F.R.S. ; Dr. C. C. Douglas ; Professor J. M. Mackintosh, M.D. ; Mrs. J. V. Robinson ; Sir Ernest D. Simon, LL.D. ; Sir Ewart Smith ; Professor W. N. Thomas, D.Phil. ; Dr. F. Yates ; Professor S. Zukerman, C.B. D.Sc., F.R.S.

Assessors : J. A. Bent ; P. Chandler ; J. H. Forshaw ; Dr. F. M. Lea ; Dr. W. A. Macfarlane ; J. Stafford

Terms of Reference

To advise on and to suggest lines of scientific research in relation to matters for which the Minister of Works is responsible ; to suggest, having regard to existing research organisations in Government departments, universities and industry, where this research could best be carried out, and to keep it under review to ensure that it is properly correlated ; to advise on the practical possibilities and further development of the results of current research, whether carried out at the instance of the Minister or otherwise, and from time to time to review from the scientific point of view the results of such development.

STANDARDS COMMITTEE

(Ministry of Works)

Appointed : August 1942

Chairman : Sydney Tatchell, F.R.I.B.A.

Secretary : P. Cutbush, A.R.I.B.A., A.I.L.A., A.A.Diploma

Terms of Reference

To consider the use of standard fittings and components in building and to recommend action which should be taken to introduce the greatest possible measure of standardisation.

A First Report, published in 1944, contained the recommendations made up to November 1943 for the preparation of Standards which should have a beneficial effect on building costs after the war ; these recommendations were referred to the British Standards Institution. The scope of the Committee was later widened by the addition of the School Furniture and Equipment Sub-Committee. Recommendations made since November 1943 are contained in a Second Report published in 1946. In this it is stated that 260 recommendations for British Standards, excluding those in the School Series, have now been made, and the Report contains a summary of progress in the preparation of Standards arising from these recommendations. Priority has been given to the recommendations considered to be of the greatest value to the housing programme, and manufacturing interests are reported to have welcomed the proposals for standardisation.

In the fields of materials and testing, it is stated that research is being

undertaken to gain knowledge to enable some of the Standards to be completed. It is appreciated that changes in designs and Standards must be gradual to avoid dislocation of production. The Committee stresses that quantity production is only possible by the adoption of some Standards, and the use of national Standards will enable planning to go ahead and facilitate advance planning of co-ordination. The Committee does not itself prepare the Standards, but acts as an investigatory and recommending body ; Standards are actually prepared and issued by the British Standards Institution.

The Committee feels that further investigatory work is needed, but that time must be allowed in which research can be carried out to provide data to continue the Committee's work and to give the British Standards Institution time to complete the preparation of Standards already recommended ; consequently the Committee recommended in December 1945 that it should go into recess for a period.

In addition to summaries of recommendations and of progress, the Report includes a memorandum on modular co-ordination, in which the Committee concludes that complete modular co-ordination based on a single small module and applied to all building components is not a practicable proposition, nor does it seem to be desirable in the interests of economy.

S.O. Code No. 70-464-2*

WELSH SLATE QUARRY INDUSTRY COMMITTEE

(Ministry of Works)

Appointed : May 1946

Chairman : Sir Frederick Rees

Secretary : Alwyn D. Rees

Terms of Reference

To consider and report upon the organisation of the Welsh slate industry and upon measures for increasing its efficiency and making it attractive to recruits, excluding wages and conditions of employment falling within the negotiating machinery of the industry.

In the Report which was presented in September 1946, the Committee states that suggestions have been made to them, as to types of machines which have proved useful or might be suitable for experimentation and advises that these ideas should be pooled with a view to increasing the efficiency of the industry. It is stressed that there is much room for experimentation and exchange of results.

The Report states that the objects of the North Wales Quarries Association include the encouragement of research into the problems of the industry and the Committee strongly supports the appointment recently made by the Ministry of Works of an experienced official to examine improved methods of working, mechanisation and other problems. To keep the industry abreast of new developments, it is considered that useful information might be obtained from the study of American and European quarrying practices by a technical expert.

(S.O. Code No. 70-511).

ADVISORY COUNCIL ON EDUCATION IN SCOTLAND

Special Committee on Technical Education

(Scottish Education Department)

Appointed : November 1943

Convener : J. Cameron Smail, O.B.E., LL.D., F.R.S.E.

Secretary : T. Grainger Stewart

Terms of Reference

Having regard to the prospective requirements of trade and industry and to the provision made for technical education in the universities, to inquire into the provision, administration and finance of technical education outwith the universities, and to make recommendations.

A Report was presented in April 1946. In Chapter 13, dealing with Research, it is stated that the progress of industry depends upon the progress of scientific research and on the speedy application of new discoveries to the problems of production and supply.

It is felt to be essential to the healthy progress of industrial technology that universities should be adequately endowed to carry on the work of pure investigation without demands for quick results.

The direct application of fundamental research to industrial uses is stated to be the function of a research institute for a single large firm or a research association serving many firms. In these research is normally confined to specialised problems, the selection of which is determined by practical and economic considerations, but it is considered to be essential to such research that those engaged in it should keep in constant touch with the methods and results of fundamental scientific investigation.

The technical departments of the central institutions have the prime function of teaching and training, but it is felt that the teachers should be given opportunity and encouragement to engage in original research. With this object the Committee recommends the provision of more varied and expensive equipment and larger staffs. It is envisaged that most of the research undertaken in technical colleges and departments will be concerned with problems of local industry and the service of firms which have no access to a research association, but those teachers who have the taste and ability for more fundamental research should be given full scope and opportunities for close contact with university research workers.

It is anticipated that the recommended improvements in technical education will increase the numbers of potential research workers, at present inadequate for the future needs of industry. An adequate system of bursaries and grants should be devised by the proposed Special Committee and the Regional Advisory Councils, so as to enable full use to be made of technological ability throughout the nation, by the training of talented students, and by enabling men and women of high ability engaged in teaching or in industry to undertake special studies.

The Committee recommends that on each reconstitution of the Advisory Council on Education in Scotland, a special committee should be appointed for technical education, to advise the Secretary of State on the national requirements in technical education and research.

Command Paper No. 6786.

COMMITTEE ON THE CHEMICAL INDUSTRY

(The Scottish Council (Development and Industry))

Appointed : May 1945

Chairman : Professor W. M. Cumming, O.B.E.

Members : James Bruce ; C. Chapman ; Dr. I. V. Hopper ; Professor J. W. Cook, F.R.S. ; Charles Oakley ; James Simpson ; John Sullivan

Secretary : Dr. Frank Rumford (Royal Technical College, Glasgow)

Terms of Reference

(1) To inquire into the present conditions and the post-war prospects of the chemical industries of Scotland ; (2) to recommend to the Scottish Council on Industry, the action required to meet the situation disclosed by the inquiry.

COMMITTEE ON PLASTICS

(Scottish Council (Development and Industry))

Appointed : February 1943

Chairman : J. M. Erskine, D.L., J.P., F.R.S.E.

Secretary : J. Gibson Kerr, W.S., F.R.A.S.

Terms of Reference

To inquire into : (1) The outlets for Plastics in Scotland ; (2) the extent to which the industry is being developed in Scotland to meet requirements. To suggest the action, if any, required to meet the situation disclosed by the inquiry.

The First Interim Report, *Plastics in Scotland*, was issued in 1946. After a preliminary survey of the plastics industry, the Report deals with its present development, and the possibilities for its development in Scotland. The Committee is of the opinion that immediate development should take place in the fabrication of mouldable material, that facilities are available for the manufacture of moulds, dies, etc., and that co-ordination of the allied chemical industry could ultimately provide for the manufacture of the mouldable material, thus dealing with the three main sections of the plastics industry.

It is thought that the new industry will not be able to finance a separate research organisation for its exclusive benefit, and it is suggested that either D.S.I.R., or other similar organisation that might be set up in Scotland, could, by arrangement with the industry, give assistance and advice which would make it possible to prosecute research in the three main aspects of the industry, until the industry could erect and control its own research organisation. At the same time, certain problems would come within the sphere of existing research organisations, and such co-operative research is considered to be of tremendous value in solving manufacturing problems and in seeking new outlets for the finished products.

It is noted that in Scotland there would be need for active research on the chemical side, which should be undertaken in conjunction with the existing chemical industry. Reference is made to the value of a co-operative survey of potentialities of the coal carbonisation, shale, cannel and oil industries. The whole field of organic chemicals opened up by the production of carbide, through the development of the Hydro-Electric Scheme in the Highlands, could be explored and co-ordinated to the needs of the expanding industry. In addition, there are many short-term problems in the existing industry, including those concerned with moulding equipment and with improvements in the physical properties of the simpler types of plastics now produced.

It is thought that at least in the earlier stages, the solution of the more fundamental aspects of these more immediate problems could be entrusted to the academic institutions. Provision of post-graduate research scholarships is advocated.

ROYAL COMMISSION ON AWARDS TO INVENTORS

Appointed under Royal Warrant : May 1946

Chairman : The Right Hon. Sir Lionel Leonard Cohen, Lord Justice of Appeal

Deputy Chairman : Kenneth R. Swan, K.C., O.B.E.

Members : Sir J. H. M. Greenly, K.C.M.G., O.B.E. ; Sir George Lee, O.B.E., M.C. ; Sir James Rae, K.C.B., K.B.E. ; Sir William Stanier, F.R.S. ; G. M. Bennett, D.Sc.

Secretary : R. G. Lloyd, M.A., B.Sc., Barrister-at-Law

Terms of Reference

Under the Royal Warrant dated 15th May, 1946, the Royal Commission on Awards to

Inventors has powers to investigate claims falling within the following four heads of its terms of reference :

Head (1) If any such dispute as is mentioned or referred to in Subsection (2) of Section 29 of the Patents and Designs Act 1907 as amended by subsequent Acts shall arise as regards either a patented invention or a registered design and the owner of the patent or registered design as the case may be and the Government Department concerned shall agree to the matter being referred for decision to the said Commissioners instead of to the Court or otherwise as mentioned in the said Subsection (2) the Commissioners may proceed to decide and settle such dispute with authority to investigate and determine so far as may be necessary for the purposes of proceedings before them all questions of infringement and validity of the patent or the design involved : Provided that any powers hereby given to the said Commissioners shall only be exercised by them upon the application of the owner of the patent or registered design as the case may be and upon his agreement to accept the decision, settlement and determination of the Commissioners.

Head (2) In any case where terms of user of any invention or design (including any terms as to selling for use, licensing or otherwise dealing with any article made in accordance therewith, or any terms as to assignment of an invention under Section 30 of the Act of 1907) have been agreed or are in course of agreement between the owner of the invention or design and any Government Department, the Commissioners may on the application of the Treasury make any recommendation as to the giving or withholding by the Treasury of approval of such agreement or proposed agreement, and may assist in adjusting or determining any term or terms of any proposed agreement as to which the parties may not be fully agreed.

Head (3) In any case of user or alleged user by any Government Department or with the approval of a Government Department by an Allied Government (other than a Dominion Government and the Government of India) of any inventions, designs, drawings or processes which, though the inventor, author or owner thereof (including a servant of the Crown) may not possess any monopoly against the Crown or any statutory right to payment or compensation, may nevertheless appear from their exceptional utility or otherwise to entitle such inventor, author or owner to some remuneration for such user (including user by way of selling for use, licensing or otherwise dealing with any articles made in accordance therewith) the Commissioners may, on the request of the Treasury inquire into the circumstances of the case and may make a recommendation to the Treasury as to the remuneration (if any) that is proper to be allowed therefor.

Head (4) In any case where, under the Agreement between His Majesty's Government and the United States Government concerning the Interchange of Patent Rights and Information, signed on 27th March, 1946, a licence authorising the use of an invention, discovery or design has been granted to the United States Government, the Commissioners may, on the request of the Treasury, determine the amount of compensation (if any), to be payable to the licensor, having regard to the utility of the invention, discovery or design, to the extent of its use in pursuance of the licence, and to all other relevant circumstances.

Rules of Procedure and General Instructions to Intending Claimants will be found in a pamphlet *Royal Commission on Awards to Inventors* (H.M.S.O.). Communications should be addressed to the Secretary, Royal Commission on Awards to Inventors, Somerset House, Strand, London, W.C.2.

ATOMIC ENERGY COMMISSION **(Scientific and Technical Committee)** (United Nations Organisation)

Appointed : 1946

Chairman : Dr. Hendrik Anthony Kramers (Netherlands)

Members

Australia : Dr. George H. Briggs

Brazil : Major Orlando Rangel ; Captain Alvaro Alberto

Canada : Dr. George C. Lawrence

China : Dr. Hsioh-Ren Wei

Egypt : Colonel Mohamed Bey Khalifa

France : Frederic Joliot-Curie ; Professor Pierre Auger

Mexico : Professor Manuel Sandoval-Vallarta

Poland : Dr. Stefan Pienkowski ; Dr. Andrej Soltan ; Jerzy Michalowski ; Ksawery Pruszycki
U.S.S.R. : Professor Dmitri Vladimirovich Skobeltsin ; Professor Simeon P. Alexandrov
United Kingdom : Sir George Paget Thomson ; Dr. Wilfrid Mann
United States : Dr. Richard Chace Tolman ; Professor J. Robert Oppenheimer ; Dr. Robert S. Bacher
Secretary : Dr. Frank Cooper

Terms of Reference

To prepare a report on the question of whether effective control of atomic energy is possible, together with an indication of the methods by which the Scientific and Technical Committee considers that effective control can be achieved.

A First Report on the scientific and technical aspects of the problem of control was published by the United Nations Department of Public Information in 1946. The Report deals with the question of whether effective control of atomic energy is possible, together with an indication of the methods by which such control could be achieved.

The first part of the Report presents the basic scientific and technical facts governing the domain of atomic energy and shows that the activities leading to peaceful and destructive ends are so intimately interrelated as to be almost inseparable. The second part consists of an analysis of the principal activities which will be carried on in the peaceful use of atomic energy, and points out the dangers which will exist if effective safeguards are not established against the use of atomic energy for destructive ends.

The Committee is hopeful that the provision of safeguards in connection with mining operations should not prove too difficult. It is stated that particular attention should be paid to the installations in which concentrated nuclear fuel is produced. Appropriate safeguards must be taken at each stage to avoid diversion of material or installations. The Committee finds no basis in the available scientific facts for supposing that effective control is not technologically feasible, but political feasibility or means of control are not discussed.

With reference to future developments, attention is drawn to the possibilities of separating U-235 from natural uranium by less costly methods, and of utilising raw materials other than uranium and thorium. The safeguards on atomic energy can, it is considered, best be adapted to any new developments if those responsible for their maintenance are intimately associated with, and fully participate in all such developments in the entire field of research.

It is stated that clandestine manufacture of atomic weapons from nuclear fuels diverted from stocks or from producing plants would be extremely difficult to discover. The Committee recommends the maintenance and strengthening of the international community of scientists, free exchange of scientific information and an increasing awareness among all scientists of one another's research activities, to assist in making less likely the application of research talent to clandestine activities. The major assurance against clandestine activities would lie in the existence of effective safeguards applied to known peaceful activities.

S.O. Code No. 83-3517*

Books, Periodicals and Films

BOOKS 1946-7

THIS list is a supplement to the list in the previous edition, which covered the period from 1939 to early 1946; the present list covers 1946 and works published or in preparation in 1947, as far as details are known. A few works published late in 1945 and omitted from the previous edition are also given. *Reference books* of earlier date are given for convenience, as in the earlier edition, and *bibliographies and indexes* covering earlier and current literature are also mentioned under the heading *Guides to Literature* at the end of the appropriate sections.

Publications of Societies and Government publications are included.

Periodical articles lie outside the scope of the list, but reference should be made to the existing periodical indexes, to the various series of Abstracts in the section *Periodicals*, and to the papers published by the research staff of industrial firms as indicated in the section *Research Laboratories of Private Firms*.

Foreign publications are not included in the list unless (i) they are obtainable through a publisher in the United Kingdom (e.g. many American books); (ii) they are standard reference works; (iii) they are reference works in a field not adequately covered elsewhere.

Arrangement. The following arrangement has been adopted for the booklist and is retained, with a few modifications, for the periodicals and films.

GENERAL SCIENCE	
General	Patents
Education, Training and Careers	Chemistry and Physics
APPLIED SCIENCE	
Building Materials	Paper and Printing
Ceramics and Glass	Plastics
Electricity and Electrical Engineering	Radiology
Engineering	Rubber
Food and Drugs	Scientific Instruments
Fuel	Soap, Perfumery, Cosmetics, etc.
Industrial Design	Textiles
Leather	Water and Water Engineering
Metals and Metallurgy	Wood and Furniture
Oil and Petroleum	Miscellaneous
Paints, Oils and Varnishes	

Reference Books for each subject will be found at the end of the appropriate section. The reference books for Chemistry and Physics are, however, at the end of the General section.

A note on *Libraries and Information Services* will be found at the end of the booklist.

GENERAL

Anthony, H. D. *Science and its Background*. (Macmillan) (In preparation, 1947). 10s. 6d.

Association of Scientific Workers. *Science and the Nation*. (Penguin Books) 1947. 1s.

Association of Scientific Workers, The Physical Society and other technical bodies. *Science and the Welfare of Mankind: Conference Report*, ed. W. E. Dick and I. B. N. Evans. (Temple Fortune Press) 1946. 2s. 6d.

Bragg, Sir William. *Science Lifts the Veil*. (British Council: Longmans) 1947. 1s. 6d.

British Association for the Advancement of Science, Burlington House, London, W.1. *Report of Conference on Scientific Research and Industrial Planning held at the London School of Hygiene and Tropical Medicine on December 7-8, 1945, under the chairmanship of Sir Richard Gregory*. 1946. 6s.

- British Commonwealth Scientific Official Conference, London, 1946. *Report of Proceedings*. (H.M.S.O. Cmd. 6970) 1946. 1s. 3d. (1s. 5d.).
- British Iron and Steel Research Association, 11, Park Lane, London, W.1. *The Place of Research in the Iron and Steel Industry*. 1946.
- British War Production. (The Times Publishing Co.) 1946. 6s.
- Brownlee, K. A. *Industrial Experimentation*. (H.M.S.O.) 1946. 2s.
- Central Organisation for Defence. (H.M.S.O. Cmd. 6923) 1946. 2s.
- City and Guilds of London Institute: Department of Technology. *Report on the Work of the Department for the Year 1945*. (Murray) 1946. 1s.
- Clifford, W. K. *The Common Sense of the Exact Sciences*. (Sigma) 1947. 15s. (Newly edited by James R. Newman).
- Colonial Office. *Colonial Research, 1945-46*. (H.M.S.O. Colonial No. 208) 1947. 1s.
- Convention between H.M. Government and the Belgian Government for the Promotion of Mutual Understanding of Intellectual, Artistic and Scientific Activities, with exchange of notes. Brussels, April 1946. (H.M.S.O. Cmd. 6841). 2d.
- Federation of British Industries. *Industry and Research: A full Report of a two-day Conference arranged by F.B.I. and held at the Kingsway Hall, London, March 27-28, 1946*. (Pitman) 1947. 10s. 6d.
- Fleming, Sir Alexander, and others. *Science Broadcasts, vol. 2*. (Worcester: Littlebury) 1946. 8s. 6d.
- Giffen, E. *Engineering Research in the University*. (Oxford University Press) 1946. 1s. 6d.
- Haldane, J. B. S. *Science Advances*. (Allen & Unwin) (In preparation, 1947). 10s. 6d.
- Heath, H. F., and A. L. Hetherington. *Industrial Research and Development*. (Faber) 1946. 25s.
- Hill, D. W. *Co-operative Research in Industry*. (Hutchinson) (In preparation, 1947). 10s. 6d. *Impact and Value of Science*. (Hutchinson) (New edition in preparation, 1947). 7s. 6d.
- Howard, R. *The Works' Technical Information Service*. (Emmott) 1946. 1s. 6d.
- Imperial College of Science and Technology. *Science in Relation to the Community*, by A. B. Ritchie. Inaugural Lecture No. 1. 1946.
- Library Association, Chaucer House, Malet Place, London, W.C.1. *University and Research Libraries of Great Britain: Their Post-War Development*. 1946. 6d.
- Low, A. M. *Six Scientific Years*. (Pendulum Publications) 1946. 2s.
- Manchester Joint Research Council, Ship Canal House, King Street, Manchester, 2. Conference on Research and the Smaller Firm, October 1946. Text of papers: *Technical Service*, by C. J. T. Cronshaw; *Existing and Potential Facilities for Research*, by F. C. Toy; etc. 1947. 2s. 6d.
- Marchant, Sir James (Ed.). *Post-War Britain*. (Includes chapters on industrial and scientific research, etc.). (Eyre & Spottiswoode) 1946. 12s. 6d.
- Ministry of Education. *Research in Technical Colleges*. (H.M.S.O.) 1946. 1d.
- Ministry of Transport. *Middle East Science: A Survey of Subjects other than Agriculture*, by E. B. Worthington. (H.M.S.O.) 1946. 7s. 6d.
- Nathanson, J. (Ed.). *Science for Democracy*. (King's Crown Press: Oxford University Press) 1946. 16s. 6d.
- Parliamentary and Scientific Committee. *Annual Report*. (Cambridge: Heffer) 1946. 1s.
- Ranshaw, G. S. *New Scientific Achievements*. (Burke Publishing Co.) 1946. 6s.
- Richardson, E. G. *Physical Science in Art and Industry*. (English Universities Press) 1947. 15s.
- Royal Institute of Chemistry. *What Industry Owes to Chemical Science*, by R. B. Pilcher and F. Butler-Jones. (Cambridge: Heffer) 1946. 18s.
- Royal Institute of International Affairs, 10, St. James's Square, London, S.W.1. *Science and the Social Order*, by C. H. Desch. 1946. 1s.
- Royal Institution of Great Britain, 21, Albemarle Street, London, W.1. *Annual Record of the Royal Institution*. 5s.
- Royal Society, Burlington House, Piccadilly, London, W.1. *The Dissemination of Scientific Information to the General Public* (prepared by a working party under the chairmanship of Sir Richard Gregory). 1946. Gratis. *Empire Scientific Conference, June-July, 1946: Preliminary Report*. (Single copies gratis). *Notes on Current Scientific Researches in the United Kingdom*. 1946. Gratis. *Report on the Needs of Research in Fundamental Science after the War*. 1945. Gratis. *Scientific Research in India*, by A. V. Hill. 1945. Gratis.

- Science Museum. *Science since 1500: A Short History of Mathematics, Physics, Chemistry and Biology*, by H. T. Pledge. (H.M.S.O.) 1946. 10s. (10s. 7d.).
- Smith, V. C., and B. B. Vance. *Science for Everyday Use*. (Lippincott) 1946. 12s. 6d.
- Society for Cultural Relations between the British Commonwealth and the U.S.S.R. *The Organisation of Science in the Soviet Union*. (H. K. Lewis) (In preparation, 1947).
- Society for Freedom in Science, University Museum, Oxford. *The Objects of the Society*. 1946. *Gratis*. Occasional Pamphlets of the Society, No. 4 and 5, 1946, free to members. Set, 6s. 7d.
- Sumner, W. L. *Progress in Science*. (Oxford: Blackwell) 1946. 8s. 6d.
- Thomson, J. A. *Science Old and New*. (Melrose) 1946. 10s. 6d.
- United Nations. *Conference for the Establishment of UNESCO, held at the Institute of Civil Engineers, London, 1945*. (H.M.S.O.) 1946. 4s. (4s. 4d.). *Constitution of the United Nations Educational, Scientific and Cultural Organisation, London, November 1945*. (H.M.S.O. Cmd. 6963) 1946. 3d. *Draft Agreement between the United Nations and UNESCO*. (H.M.S.O.) 1946. 6d. (7d.). *The Tasks and Functions of the Secretariat's Division of Natural Science*. 1946.
- Vavilov, S. I. *Soviet Science in the Service of the People; and An Outline of the History of the Academy of Sciences, U.S.S.R.*, by V. L. Komarov. (Soviet News) 1946. 1s. 6d.
- Weaver, E. C., and L. S. Foster. *Chemistry for Our Times*. (McGraw-Hill) 1947. 12s. 6d.
- Westinghouse, G. *Centennial Forum: Science and Life in the World*. (McGraw-Hill). 1947. 12s. 6d.
- Worrall, R. L. *Outlook of Science: Modern Materialism*. (Including bibliography). (Staples) 1946. 12s. 6d.

REFERENCE BOOKS

*Dictionaries and Encyclopaedias**

- Beadnell, C. M. *Dictionary of Scientific Terms*. (Watts) 1942. 2s. *Encyclopaedic Dictionary of Science and War*. (Watts) 1943. 25s.
- Bennett, H. *Standard Chemical and Technical Dictionary*. (Technical Press) 1941. 65s.
- Bray, A. (Ed.). *Russian-English Scientific Technical Dictionary*. (New York: International University Press) 1945. 50s.
- Callahan, L. *Russian-English Chemical and Technical Dictionary*. (Wiley: Chapman & Hall) In the press, 1947.
- Chambers's Technical Dictionary*, revised, with supplement. (W. & R. Chambers) 1944. 20s.
- Corney, A. M., and D. A. Hahn (revised by). *Dictionary of Chemical Solubilities: Inorganic*. (Macmillan) 60s. Out of print.
- De Vries, L. *German-English Science Dictionary for Students in the Agricultural, Biological and Physical Sciences*. (McGraw-Hill) 1946. 22s. 6d.
- Faraday's Encyclopaedia of Hydrocarbon Compounds*, compiled by J. E. Faraday. Vol. 1. (Manchester: Chemindex) 1945. 150s.
- Gardner, W. *Chemical Synonyms and Trade Names: A Dictionary and Commercial Handbook*. (Technical Press) 1936. 35s.
- Glazebrook, Sir Richard. *Dictionary of Applied Physics*. (Macmillan) 1922-23. 5 vols., 63s. per vol. Out of print.
- Gregory, T. C. (Ed.). *The Condensed Chemical Dictionary*. (Chapman & Hall) 1942. 72s.
- Hackh, I. W. D. *Chemical Dictionary*, revised and edited by Julius Grant. (Churchill) 1944. 60s.
- Hansen. *Danish-English Technical Dictionary*. (About 1945-6). (Bailey Bros. and Swinfen). 30s.
- Heilbron, Sir Ian, and H. M. Bunbury (Ed.). *Dictionary of Organic Compounds*. (Eyre & Spottiswoode) 1943. 3 vols., 126s. each, the set 315s.
- Jacobson, C. A. *Encyclopaedia of Chemical Reactions*. Vol. 1. (Reinhold: Chapman & Hall) 1946. 60s.

* *Science Library Bibliographical Series No. 619* should also be consulted for technical dictionaries and glossaries.

- Kingzett, T. C. (Ed.). *Chemical Encyclopaedia: A Digest of Chemistry and Chemical Industry*. (Baillière, Tindall & Cox) 1945. 45s.
- Kurtz, A. K., and H. A. Edgerton. *Statistical Dictionary of Terms and Symbols*. (Chapman & Hall) 1940. 12s.
- Miall, S. *A New Dictionary of Chemistry*. (Longmans) 1940. 42s.
- Newmark, M. *Dictionary of Science and Technology: English, French, German and Spanish*. (Pitman) 1946. 30s. *Illustrated Technical Dictionary*. (Crowther) 1947. 25s.
- Patterson, A. M. *French-English Dictionary for Chemists*. (Wiley: Chapman & Hall) 1921. 21s. *German-English Dictionary for Chemists*. (Wiley: Chapman & Hall) 1935. 22s. 6d.
- Schoengold, M. D. (Ed.). *Encyclopaedia of Substitutes and Synthetics*. (Spon) 1944. 60s.
- Thorpe, J. F., and M. A. Whiteley. *Dictionary of Applied Chemistry*. (Longmans) Revised edition 1945-47. 8 vols., 80s. each. (8th volume in the press).
- Webel, A. *German-English Dictionary of Technical, Scientific and General Terms*. (Routledge) 1945. 40s.
- Weld, R. D. Le. *Glossary of Physics*. (McGraw-Hill) 1937. 15s.

Directories

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- Journal of the British Association of Chemists*, Empire House, 175, Piccadilly, London, W.1. Alternate months, 6d., annual subscription 3s. 6d.
- Journal of the Chemical and Physical Society*, University College, London, W.C.1. Three times a year.
- Journal of the Chemical Society*, Burlington House, London, W.1. Monthly, 7s. 6d. post free, annual subscription 75s., post free.
- Journal of Documentation*, Association of Special Libraries and Information Bureaux, 52, Bloomsbury Street, London, W.C.1. Quarterly, 5s. members, 7s. 6d. non-members, annual subscription 25s. non-members.
- Journal of General Microbiology*, Cambridge University Press, for the Society for General Microbiology. Three times a year, annual subscription 50s.
- Journal of the Royal Society of Arts*, 6-8, John Adam Street, Adelphi, London, W.C.2. Fortnightly at present, 2s., annual subscription 56s. 4d.
- Journal of Scientific Instruments*, The Institute of Physics, 47, Belgrave Square, London, S.W.1. Monthly, 5s., annual subscription 50s. (post free). Produced with the co-operation of the National Physical Laboratory.
- Journal of the Society of Chemical Industry*, 56, Victoria Street, London, S.W.1. Monthly, 3s. 6d., annual subscription 35s.
- Manufacturing Chemist* (including Abstracts), 17, Stratford Place, London, W.1. Annual subscription 25s., 3 years, 50s.

* With a single exception, this list contains only British and Irish publications.

- Mass Production*, 4, Ludgate Circus, London, E.C.4. Monthly, 1s. 6d., annual subscription 20s.
- Mineralogical Magazine* (with a separately-paged appendix of Mineralogical Abstracts), Mineralogical Society, British Museum (Natural History), South Kensington, London, S.W.7. Quarterly, 12s., annual subscription 40s.
- Monthly Science News*, British Council (Science Department), 3, Hanover Street, London, W.1. Monthly, *gratis* to overseas scientists.
- Nature*, St. Martin's Street, London, W.C.2. Weekly, 1s. 6d., annual subscription 90s.
- Official Journal (Patents)*, Patent Office, 25, Southampton Buildings, London, W.C.2. Weekly, 1s., annual subscription 50s.
- Penguin Science News*, edited by John Enogat, Harmondsworth, Middlesex. Occasional, 1s. per copy.
- Philosophical Magazine*, Red Lion Court, Fleet Street, London, E.C.4. Monthly, 10s., annual subscription 102s. 6d.
- Philosophical Transactions of the Royal Society*, Burlington House, London, W.1. Series A and B, at irregular intervals and at various prices.
- Proceedings of the British Society for International Bibliography*. Six issues per annum, 4s., annual subscription 15s. (Heffer, Cambridge.)
- Proceedings of the Cambridge Philosophical Society*, Bentley House, 200, Euston Road, London, N.W.1. Quarterly, 15s., annual subscription 42s.
- Proceedings of the Physical Society*, 1, Lowther Gardens, London, S.W.7. Six times a year, 8s. 10d. post free, annual subscription 42s.
- Proceedings of the Royal Institution of Great Britain*, 21, Albemarle Street, London, W.1. Twice yearly, 12s. 6d. each.
- Proceedings of the Royal Irish Academy*, 36, Great Russell Street, London, W.C.1. Appears at irregular intervals, price varies.
- Proceedings of the Royal Society*, Burlington House, London, W.1. Series A (*Mathematical and Physical Papers*), 2 parts per month, 9s. each, annual subscription 35s. (bound), 30s. (unbound). Series B (*Biological Papers*), monthly, 9s., annual subscription 35s. (bound), postage extra in both series.
- Proceedings of the Royal Society of Edinburgh*, 22, George Street, Edinburgh, 2. Section A: *Mathematics and Physics*. Section B: *Biology*. Vols. 1-62, 1838-1946, charges vary.
- Quarterly Reviews of the Chemical Society*, Burlington House, London, W.1. 8s. each, annual subscription 25s.
- Reports on Progress in Physics*, The Physical Society, 1, Lowther Gardens, London, S.W.7. Annually, 30s. (At present bi-ennially).
- The Reprint*, Society of Inventors, Chamber of Commerce Building, 1, Old Hall Street, Liverpool. Monthly, *gratis* to members and associate members.
- School Science Review*, Albemarle Street, London, W.1. Three issues per annum, 3s. 6d. each, annual subscription 11s. 6d.
- Science in Parliament* (a précis of Parliamentary reference to scientific and technical matters), Parliamentary and Scientific Committee, 6, Queen Anne's Gate, London, S.W.1. Bi-monthly, annual subscription 63s.
- Science Progress*, 41, Maddox Street, London, W.1. Quarterly, 7s. 6d., annual subscription 31s. 2d.
- Science To-day*, 104, Clifton Hill, London, N.W.8. Weekly, annual subscription (50 issues), 30s.
- Scientific Journal of the Royal College of Science*, South Kensington, London, S.W.7. July, 7s. 6d.
- Scientific Worker*, Association of Scientific Workers, 15, Half Moon Street, Piccadilly, London, W.1. Six times per annum, 1s. each, annual subscription 6s. 6d.
- Standards Review*, British Standards Institution, 28, Victoria Street, London, S.W.1. 7s. for four issues, 3s. 6d. to members.
- The Times Review of Industry* (formerly *The Times Trade and Engineering*), Printing House Square, London, E.C.4. Monthly, 1s., annual subscription 15s. (Canada 13s. 6d.).
- Trade Marks Journal*, Patent Office, 25, Southampton Buildings, London, W.C.2. Weekly, 1s., annual subscription 50s.
- Transactions of the Faraday Society* (Messrs. Gurney & Jackson). Monthly or bi-monthly, 5s. and 10s. respectively, annual subscription 60s., 40s. members' subscription.

- Transactions of the Institute of Chartered Patent Agents*, Staple Inn Buildings, London, W.C.1. Annually, 10s. 6d.
- Transactions of the Royal Society of Edinburgh*, 22, George Street, Edinburgh, 2. Vols. 1-61, 1783-1946. Charges vary.
- Transactions of the Society of Chemical Industry*, 56, Victoria Street, London, S.W.1. Monthly, 3s. 6d., annual subscription 35s.

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Analytical Chemistry Abstracts, see *Analyst* above.

Aperçu de la Presse Technique, Centre de Documentation de la Mécanique, 11, avenue Hoche, Paris, 8e. Annual subscription 500 francs. (Abstracts from French, Belgian, Dutch, Swiss, British and American journals and periodicals.)

British Chemical Abstracts, Bureau of Abstracts, 9-10, Savile Row, London, W.1. Series A. (I) *General, Physical and Inorganic Chemistry*, annual subscription 55s. (II) *Organic Chemistry*, annual subscription 55s. (III) *Physiology and Biochemistry including Anatomy*, annual subscription 80s. AI, II, III together, 160s. Series B. (I) *Chemical Engineering and Industrial Inorganic Chemistry*, annual subscription 55s. (II) *Industrial Organic Chemistry*, annual subscription 55s. (III) *Agriculture, Foods and Sanitation*, annual subscription 35s. BI, II, III together, 125s. All published monthly. Series C. *Analysis and Apparatus*. Quarterly, annual subscription 15s.

Chemical Abstracts (Manufacturing Chemistry), see *Manufacturing Chemist* above.

Davy Faraday Research Laboratory Abstracts, see *Proceedings of the Royal Institution of Great Britain* above.

Industrial Chemistry Abstracts from the foreign press, see *Industrial Chemist* above.

Mineralogical Abstracts, see *Mineralogical Magazine* above.

Physics Abstracts, Abstracts of Papers, National Physical Laboratory (D.S.I.R.) Teddington, Middlesex. Annually.

Physics Abstracts, see *Science Abstracts* below.

Raw Material Abstracts, and classified bibliographies of current technical literature on animal products, etc., see *Bulletin of the Imperial Institute* above.

Science Abstracts, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2. Section A (*Physics*), monthly, 3s. 6d., annual subscription 35s. Section B (*Electrical Engineering*), monthly, 3s. 6d., annual subscription 35s. Both sections, if taken together, annual subscription 60s.

Scientific Instruments Abstracts, see *Bulletin of the British Scientific Instrument Research Association* above.

BUILDING AND CONSTRUCTIONAL MATERIALS*

Building, 33, Tothill Street, Westminster, London, S.W.1. Monthly, 2s., annual subscription 20s.

Cement and Lime Manufacture, 14, Dartmouth Street, London, S.W.1. Alternate months, 1s., annual subscription 6s.

Cement, Lime and Gravel, Salisbury Square House, London, E.C.4. Monthly, 1s., annual subscription 10s.

Concrete and Constructional Engineering, 14, Dartmouth Street, London, S.W.1. Monthly, 1s. 6d., annual subscription 18s.

Concrete Building and Concrete Products, 14, Dartmouth Street, London, S.W.1. Monthly, 4d., annual subscription 4s.

The King's Highway, Asphalt Roads Association, Ltd., 53, Victoria Street, London, S.W.1. Twice a year, January and July, 1s. a copy.

Reinforced Concrete Review, Reinforced Concrete Association, York Mansions, 94, Petty France, London, S.W.1. Quarterly, 2s. 6d.

Timber and Plywood, 194-200, Bishopsgate, London, E.C.2. Weekly, 8d., annual subscription 30s. inland, 40s. foreign.

Timber Development Association Quarterly Review, 75, Cannon Street, London, E.C.4. Copies supplied January, April, July, October, to members only.

Wood, 33, Tothill Street, London, S.W.1. Monthly, 2s., annual subscription 20s.

ABSTRACTS

Building Science Abstracts, Department of Scientific and Industrial Research. Monthly, 1s. 6d. (1s. 7d.), annual subscription, (H.M.S.O.).

* See also *Engineering*.

Forestry Abstracts : Section 3, Forest Products and Utilisation, Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Great Britain. Quarterly, 3s., annual subscription 10s. (post free).
Road Abstracts, compiled by the Department of Scientific and Industrial Research, Road Research Laboratory, Harmondsworth, Middlesex, and the Ministry of Transport. Issued fortnightly in neostyled form to technical press. Also as monthly supplement (1s. each, 15s. per annum) to *Journal of the Institution of Municipal and County Engineers*.

CERAMICS AND GLASS

Bulletin of the British Refractories Research Association. Quarterly. Confidential, to members only.
Glass, 9, Moor Park Road, Northwood, Middlesex. Monthly, 1s., annual subscription 12s.
Glass Review, Glass Delegacy of the University of Sheffield, "Elmfield", Northumberland Road, Sheffield, 10. About eleven times per annum, available to members only.
Journal of the Society of Glass Technology (including Abstracts), "Elmfield", Northumberland Road, Sheffield, 10. Alternate months, 15s., annual subscription 75s.
Pottery and Glass, 17, Stratford Place, London, W.1. Monthly, subscription 25s. post free for one year; 40s. post free, two years; 50s. post free, three years.
Refractories Journal (including Abstracts from current literature), Rodney House, 6, Monmouth Street, London, W.C.2. Monthly, 1s. 6d. plus postage, annual subscription 20s. in Great Britain, 25s. overseas.
Transactions of the British Ceramic Society (including Abstracts), North Staffordshire Technical College, Stoke-on-Trent. Monthly, 5s., annual subscription 50s.

ABSTRACTS

British Ceramic Abstracts, see *Transactions of the British Ceramic Society* above.
Glass Abstracts, see *Journal of the Society of Glass Technology* above.
Refractories Abstracts, see *Refractories Journal* above.

ELECTRICITY AND ELECTRICAL ENGINEERING

Beama Journal, British Electrical and Allied Manufacturers Association, 36, Kingsway London, W.C.2. Monthly, 1s., annual subscription 10s.
B.T.H. Activities, British Thomson-Houston Co., Ltd., Rugby. Bi-monthly, private circulation, *gratis* to engineers and technical executives.
British Journal of Radiology, British Institute of Radiology, 32, Welbeck Street, London, W.1. Monthly, 4s., annual subscription 42s.
Contact, 63-81, Pelham Street, London, S.W.7. Monthly, 2d., annual subscription 2s.
Distribution of Electricity (including résumé of technical literature), W. T. Henley's Telegraph Works, Hatton Garden, London, E.C.1. Quarterly, 6d., annual subscription 2s. 8d.
Electric Vehicles, 23, Great Queen Street, London, W.C.2. Monthly, 6d., annual subscription 7s. 6d. post free.
Electrical Industries, 23, Great Queen Street, London, W.C.2. Monthly, 1s., annual subscription 12s. post free.
Electrical Power Engineer, Electrical Power Engineers' Association, 102, St. George's Square, London, S.W.1. Monthly, 6d., annual subscription 10s.
Electrical Review, Dorset House, Stamford Street, London, S.E.1. Weekly, 9d., annual subscription 47s. 8d.
Electrical Supervisor, The Association of Supervisory Electrical Engineers, 54, Station Road, New Barnet, Herts. Monthly, 6d., annual subscription 8s.
Electrical Times, Sardinia House, Sardinia Street, Kingsway, London, W.C.2. Weekly, 6d., annual subscription 35s.
Electrician, Bouverie House, Fleet Street, London, E.C.4. Weekly, 6d., annual subscription 30s. Home and Overseas.
Electronic Engineering, 43-44, Shoe Lane, London, E.C.4. Monthly, 2s., annual subscription 26s.
Electronics Forum, Institution of Electronics, 24, Buckingham Street, Strand, London, W.C.2. Quarterly, 1s. 6d., annual subscription 6s.

- English Electric Journal*, Publicity Department, Foregate Street Factory, Stafford. Three issues per annum, 1s. 3d. each, annual subscription 3s. 9d.
- G.E.C. Journal* (including Abstracts of technical literature), Magnet House, Kingsway, London, W.C.1. Two issues per annum, 1s. each, no annual subscription.
- Journal of the British Institution of Radio Engineers*, 9, Bedford Square, London, W.C.1. Bi-monthly, 7s. 6d. (non-members).
- Journal of the Electrodepositors' Technical Society*, Northampton Polytechnic, St. John's Street, London E.C.1. Annually, 21s.
- Journal of the Institution of Electrical Engineers*, Savoy Place, Victoria Embankment, London, W.C.2. Part I (*General*) monthly, 6s., annual subscription 21s. Part II (*Power Engineering*) alternate months, 7s. 6d., annual subscription 31s. 6d. Part III (*Communication Engineering*) alternate months, 7s. 6d., annual subscription 31s. 6d. If Parts I, II, and III together, annual subscription 63s.
- Journal of the Television Society*, Hedgeside, Holtspur End, Beaconsfield, Bucks. Quarterly, 5s., annual subscription 20s.
- Light and Lighting*, see under Engineering.
- Metropolitan-Vickers Gazette* (including Abstracts), Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17. Alternate monthly, 1s., annual subscription 6s.
- Osram Bulletin and G.E.C. Progress Sheet*, Magnet House, Kingsway, London, W.C.1. Monthly, gratis to bona fide inquirers.
- Philips Technical Review*, Century House, Shaftesbury Avenue, London, W.C.2. Monthly, 2s., annual subscription 21s.
- Post Office Electrical Engineers' Journal*, G.P.O., Alder House, London, E.C.1. Quarterly, 1s., annual subscription 5s. (post free).
- Public Lighting*, see under Engineering.
- R.S.G.B. Bulletin*, Incorporated Radio Society of Great Britain, 28, Little Russell Street, London, W.C.1. Monthly, 1s. 6d. (gratis to members), annual subscription to *Journal* 18s.
- Science Forum*, see *Electronics Forum*.
- Scottish Electrical Engineer*, 27a, Cadogan Street, Glasgow. Monthly, 6d., annual subscription 6s.
- Strowger Journal*, Automatic Telephone and Electric Co., Ltd., Strowger Works, Liverpool, 7. Biennially. Distributed gratis to restricted list.
- Students Quarterly Journal*, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2. 3s., annual subscription 10s.
- Transactions of the Illuminating Engineering Society*, see under Engineering.
- Wireless Engineer : Journal of Radio Research and Progress* (including Abstracts), Dorset House, Stamford Street, London, S.E.1. Monthly, 2s. 6d., annual subscription 32s.
- Wireless World*, Dorset House, Stamford Street, London, S.E.1. Monthly, 1s. 6d., annual subscription 20s.
- Zodiac*, Electra House, Victoria Embankment, London, W.C.2. Monthly, 6d., annual subscription 6s. post free.

ABSTRACTS

- Electrical Abstracts*, see *G.E.C. Journal* above, and *Metropolitan-Vickers Gazette* above.
- Electrical Engineering Abstracts* (Part B of *Science Abstracts*), Institution of Electrical Engineers, Savoy Place, London, W.C.2. Monthly, 3s. 6d., annual subscription 35s. 6d.
- Electricity Distribution Abstracts*, see *Distribution of Electricity* above.
- Radio Abstracts* (D.S.I.R.), see *Wireless Engineer* above.

ENGINEERING (other than Electrical) *

- Agricultural Engineering Record*, (H.M.S.O.). Four times a year, 1s., annual subscription 4s. 8d. (Editorial, National Institute of Agricultural Engineering, Askham Bryan, York.)
- Air Treatment Engineer*, 147, Victoria Street, London, S.W.1. Monthly, 1s., annual subscription 10s.
- Aircraft Engineering*, 12, Bloomsbury Square, London, W.C.1. Monthly, 2s. 6d., annual subscription 30s.

* See also Mining.

- Aircraft Production*, Dorset House, Stamford Street, London, S.E.1. Monthly, 2s. 6d., annual subscription 34s. 6d.
- Automobile Engineer*, Dorset House, Stamford Street, London, S.E.1. Monthly, 2s. 6d., annual subscription 37s. 4d.
- British Machine Tool Engineering*, 17, Grosvenor Gardens, London, S.W.1. Quarterly, 2s., annual subscription 9s. 6d.
- Bulletin of the Motor Industry Research Association*, Great West Road, Brentford, Middlesex. Quarterly, circulated to members only.
- Capacity Exchange Gazette*, Engineering Industries Association, 9, Seymour Street, London, W.1. Fortnightly, annual subscription part of membership service.
- Civil Engineering and Public Works Review*, Aldwych House, London, W.C.2. Monthly, 1s. 6d., annual subscription 15s.
- Compressed Air and Hydraulic Engineering*, 25, Victoria Street, London, S.W.1. Monthly, 1s., annual subscription 10s.
- Consulting Engineer*, 147, Victoria Street, London, S.W.1. Alternate months, 2s., annual subscription 15s.
- Diesel Railway Traction*, 33, Tothill Street, Westminster, London, S.W.1. Monthly, 2s., annual subscription 20s.
- Engineer*, 26, Essex Street, Strand, London, W.C.2. Weekly, 1s. 6d. (1s. 9d. post free), annual subscription 90s.
- Engineering*, 35-36, Bedford Street, Strand, London, W.C.2. Weekly, 1s. 6d., annual subscription 90s. Canada only, 85s.
- Engineering and Boiler-House Review*, 23, Great Queen Street, London, W.C.2. Monthly, 2s., annual subscription 24s. post free.
- Engineering Industries Association Bulletin*, 9, Seymour Street, London, W.1. Monthly, annual subscription part of membership service.
- Engineering Inspection*, Institution of Engineering Inspection, 2, Caxton Street, London, S.W.1. Quarterly, 2s. 6d., annual subscription 10s.
- Engineering Materials and Processes*, 37-38, Hatton Garden, London, E.C.1. Alternate months, 2s. 6d., annual subscription 15s.
- Ford Times*, 88, Regent Street, London, W.1. Alternate months, 4d., annual subscription 3s. 6d. Abroad, 4s. 6d.
- General Lighting Information Service Bulletin*, 25, Victoria Street, London, S.W.1. Ten issues per annum, annual subscription 30s.
- Heating and Ventilating Engineer and Journal of Air Conditioning*, Carlisle House, 8, Southampton Row, Strand, London, W.C.1. Monthly, 6d., annual subscription 7s. 6d.
- Highways, Bridges and Aerodromes*, Crescent House, Ashford, Middlesex. Weekly, 3d., annual subscription 15s.
- Industrial Heating Engineer*, 90, High Holborn, London, W.C.1. Alternate months, 1s., annual subscription 6s.
- Irish Engineering and Electrical News*, 3, Brunswick Street, Belfast. Quarterly, 6d., annual subscription 2s. 6d.
- Journal and Proceedings of Permanent Way Institution (Inc.)*, 19, Weald View Road, Tonbridge. Three times a year, 2s. 6d.
- Journal and Transactions of the Society of Engineers (Inc.)*, 17, Victoria Street, London, S.W.1. Two issues in January and July, 3s. 6d. each, annual subscription 7s.
- Journal of the British Shipbuilding Research Association*, 5, Chesterfield Gardens, Curzon Street, London, W.1. Monthly, *gratis* (primarily consists of Abstracts from current technical literature).
- Journal of the Institution of Automobile Engineers* (including Abstracts), 12, Hobart Place, London, S.W.1. Eight copies per annum, 7s. 6d. each.
- Journal of the Institution of Civil Engineers*, Great George Street, London, S.W.1. Eight times per annum, in November to May, and October, 5s., annual subscription 40s. (post free). Orders should be sent to Pitmans.
- Journal of the Institution of Heating and Ventilating Engineers*, 72-74, Victoria Street, London, S.W.1. Monthly, 2s. 6d., annual subscription 30s. to accepted subscribers only.
- Journal of the Institution of Production Engineers* (including Abstracts), 36, Portman Square, London, W.1. Monthly, 5s., annual subscription 60s.
- Journal of the Institution of Sanitary Engineers*, 118, Victoria Street, London, S.W.1. Quarterly, 4s., annual subscription 16s.
- Journal of the Institution of Water Engineers*, see under Water and Water Engineering.

- Journal of the Junior Institution of Engineers (Inc.)*, 39, Victoria Street, London, S.W.1. Monthly, 2s. 6d. post free.
- Journal of the Royal Aeronautical Society* (including Abstracts), 4, Hamilton Place, London, W.1. Monthly, 7s. 6d., annual subscription 93s.
- Light and Lighting* (including Abstracts), Illuminating Engineering Society, 32, Victoria Street, London, S.W.1. Monthly, 9d., annual subscription 10s. 6d.
- Machine Shop Magazine*, Dorset House, Stamford Street, London, S.E.1. Monthly, 1s., annual subscription 15s.
- Machine Tool Review*, Alfred Herbert, Ltd., 70, Vauxhall Bridge Road, London, S.W.1. Alternate months, 1s., annual subscription 7s. 6d.
- Machinery*, National House, West Street, Brighton, 1. Weekly. Half-yearly subscription 16s., annual subscription 32s.; overseas 17s. and 34s. respectively, post free in each case.
- Marine Engineer* (including Abstracts from the foreign press), 9, Catherine Place, London, S.W.1. Monthly, 1s. 9d., annual subscription 26s.
- Mechanical Handling*, Dorset House, Stamford Street, London, S.E.1. Monthly, 1s., annual subscription 14s.
- Mechanical World and Engineering Record*, 31, King Street West, Manchester, 3. Weekly, 6d., annual subscription 25s.
- Mine and Quarry Engineering*, see under Mining and Quarrying.
- Mining Electrical and Mechanical Engineer*, The Association, 28, Kennedy Street, Manchester. Monthly, 2s. 6d., annual subscription 30s. (foreign countries, 40s.).
- Oil Engine and Oil Turbine*, Bowling Green Lane, London, E.C.1. Monthly, 2s., annual subscription 26s.
- Power and Works Engineering*, 33, Tothill Street, London, S.W.1. Monthly, 2s., annual subscription 20s.
- Power Transmission*, 65-66, Chancery Lane, London, W.C.2. Monthly, 1s., annual subscription 10s.
- Precision*, Automotive Products Co., Lachbrook Road, Leamington Spa. Monthly, gratis.
- Proceedings of the Institution of Mechanical Engineers*, Storey's Gate, St. James's Park, London, S.W.1. Annual subscription 68s. (including postage).
- Public Lighting*, Association of Public Lighting Engineers, 68, Victoria Street, London, S.W.1. Quarterly, 1s., annual subscription 4s. 6d.
- Quarterly Journal, Institution of Fire Engineers*, 2, Millbank House, Great Peter Street, London, S.W.1. Quarterly, 2s. 6d., annual subscription 10s. 6d.
- Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1. Weekly, 1s., annual subscription 45s.
- Shipbuilder and Marine Engine-Builder*, 47, Victoria Street, London, S.W.1. Monthly, 1s. 6d., annual subscription 21s.
- Shipbuilding and Shipping Record*, 33, Tothill Street, London, S.W.1. Weekly, 1s., annual subscription 45s.
- Steam Engineer*, 90, High Holborn, London, W.C.1. Monthly, 1s., annual subscription 10s.
- Structural Engineer*, Institution of Structural Engineers, 11, Upper Belgrave Street, London, W.1. Monthly, 1s., annual subscription 14s. 6d. (to members only).
- Transactions of the Illuminating Engineering Society*, 32, Victoria Street, London, S.W.1. Monthly, 2s. 6d., annual subscription 21s.
- Transactions of the Institute of Marine Engineers* (including Abstracts of the technical press), 85, Minorities, London, E.C.3. Monthly, 6s., annual subscription 72s., to non-members.
- Transactions of the Institute of Welding*, see under Metals.
- Transactions of the Institution of Chemical Engineers*, 56, Victoria Street, London, S.W.1. Yearly, 21s.
- Transactions of the Institution of Engineers and Shipbuilders in Scotland*, 39, Elmbank Crescent, Glasgow, C.2. Seven times a year, 5s. each. Annual subscription 35s. (paper) and 40s. (cloth).
- Transactions of the Institution of Gas Engineers*, see under Gas.
- Transactions of the Institution of Mining Engineers*, see under Mining and Quarrying.
- Transactions of the Institution of Naval Architects*, 10, Upper Belgrave Street, London, S.W.1. Annually, 63s.
- Transactions of the Liverpool Engineering Society*, 9, The Temple, 24, Dale Street, Liverpool. Annually, 21s.

- Transactions of the Manchester Association of Engineers*, St. John Street Chambers, Deansgate, Manchester. Annually, 12s. 6d.
- Transactions of the North East Coast Institution of Engineers and Shipbuilders*, Bolbec Hall, Westgate Road, Newcastle-upon-Tyne. 8 issues, 5s., annual subscription 42s. Bound volume, 30s. per volume (annual), plus postage.
- War Emergency Proceedings of the Institution of Mechanical Engineers*, Storey's Gate, St. James's Park, London, S.W.1. Appears irregularly, 3s. 6d. to 7s. 6d. each, annual subscription 63s. (plus 5s. postage).

ABSTRACTS

- Aerodrome Abstracts*, Department of Scientific and Industrial Research, Road Research Laboratory, Harmondsworth, Middlesex. Alternate months (neostyled form), and printed in full as a supplement to the *Journal of the Institution of Civil Engineers*. Not on sale.
- Aeronautics Abstracts*, see *Journal of the Royal Aeronautical Society* above.
- Automobile Abstracts*, see *Journal of the Institution of Automobile Engineers* above.
- Engineering Abstracts*, Institution of Civil Engineers, Great George Street, London, S.W.1. (Suspended for duration of war, not yet recommenced).
- Engineering Index*, see Books section.
- Engineers' Digest*, 120, Wigmore Street, London, W.1. Monthly, 4s. 6d., annual subscription 42s.
- Lighting Abstracts*, see *Light and Lighting* above.
- Marine Engineering Abstracts*, see *Transactions of the Institute of Marine Engineers* above.
- Motor Industry Research Association Abstracts*, Great West Road, Brentford, Middlesex. Monthly, members only.
- Production Engineering Abstracts*, see *Journal of the Institution of Production Engineers* above.
- Railway Engineering Abstracts*, The Institution of Civil Engineers, Great George Street, London, S.W.1. Every two months, 7s. each to non-members, 35s. per annum.
- Road Abstracts*, see under Building and Constructional Materials.

FOOD AND DRUGS

- Baker and Confectioner*, 11-13, Breams Buildings, London, E.C.4. Weekly, 3d., annual subscription 17s. 6d. post free.
- Brewer and Wine Merchant and Brewers' Guardian*, 7, Garrick Street, London, W.C.2. Monthly, annual subscription 30s.
- Brewers' Journal and Hop and Malt Trades' Review*, Eastcheap Buildings, London, E.C.3. Monthly, 3s., annual subscription 30s.
- Brewing Trade Review*, 21-23, Laurence Pountney Lane, London, E.C.4. Monthly, 3s. 6d., annual subscription 40s.
- British Food Journal and Hygienic Review*, 22, Northumberland Avenue, London, W.C.2. Monthly, 1s. 6d., annual subscription 18s. 6d.
- British Journal of Nutrition*, The Nutrition Society. (Cambridge University Press). Quarterly, 20s., annual subscription 60s.
- British Journal of Pharmacology and Chemotherapy*, British Medical Association, Tavistock Square, London, W.C.1. Quarterly, 7s. 6d., annual subscription 25s.
- Chemist and Druggist*, 28, Essex Street, London, W.C.2. Weekly, 1s., annual subscription 30s.
- Confectionery Production*, Berwyn, St. Mary's Road, Ditton Hill, Surbiton, Surrey. Monthly, 1s. 6d., annual subscription 15s.
- Dairy Industries (incorporating Ice Cream Manufacture)*, 24, Bride Lane, London, E.C.4. Monthly, 2s., annual subscription 20s.
- Flavours*, 110, Old Broad Street, London, E.C.2. Alternate months, 2s. 6d., annual subscription 12s. 6d.
- Food (including Food Abstracts)*, 33, Tothill Street, London, S.W.1. Monthly, 2s., annual subscription 20s.
- Food Manufacture*, 17, Stratford Place, London, W.1. Annual subscription 20s. 3 years, 40s.
- Food and Nutrition*, Ministry of Food (H.M.S.O.). Monthly, 3d. (4d.).

- Food Research*: Journal of the British Food Manufacturers' Research Association (including Abstracts), The Association, 25, Buckingham Gate, London, S.W.1. Quarterly, *gratis* to members, not available otherwise.
- Food Trade Review* (including Abstracts of technical articles), 7, Garrick Street, London, W.C.2. Monthly, 1s. 6d., annual subscription 10s.
- International Sugar Journal* (including Abstracts of chemical reports), 7-8, Idol Lane, London, E.C.3. Monthly, 2s., annual subscription 25s.
- Iodine Facts*, Iodine Educational Bureau, Stone House, Bishopsgate, London, E.C.2. Appears at irregular intervals, *gratis*.
- Journal of the British Food Manufacturing Industries Research Association*. Approximately quarterly, issued to members.
- Journal of Dairy Research*, 200, Euston Road, London, N.W.1. Three parts, 10s., 25s. per volume.
- Journal of the Incorporated Brewers' Guild*, 8, Bream's Buildings, London, E.C.4. Monthly, 1s. 3d., annual subscription 15s.
- Journal of the Institute of Brewing*, The Goring Hotel, Grosvenor Gardens, London, S.W.1. Alternate months, 7s., annual subscription 42s.
- The Miller*, Bouverie House, Fleet Street, London, E.C.4. Weekly, all copies 9d. (postage extra), annual subscription 30s. home and abroad.
- Milling*, 37, Victoria Street, Liverpool, 1. Weekly, 1s., annual subscription 31s. 6d.
- Pharmaceutical Journal*, Pharmaceutical Society of Great Britain, 17, Bloomsbury Square, London, W.C.1. Weekly, 1s., annual subscription 42s.
- Quarterly Journal of Pharmacy and Pharmacology* (including Abstracts from the technical press), 17, Bloomsbury Square, London, W.C.1. Quarterly, 10s., annual subscription 30s.

ABSTRACTS

- Abstracts of the British Food Manufacturing Industries Research Association*. Approximately quarterly, issued to members.
- Brewing Abstracts*, see *Journal of the Institute of Brewing* above.
- Dairy Science Abstracts*, Imperial Bureau of Dairy Science, Shinfield, nr. Reading. Quarterly, 7s. 6d., annual subscription 25s.
- Food Abstracts*, see *Food*, *Food Research* and *Food Trade Review* above.
- Index to the Literature of Food Investigation*, Food Investigation Board, Department of Scientific and Industrial Research, H.M.S.O. Quarterly, 4s. 6d.
- Nutrition Abstracts and Reviews*, Imperial Bureau of Animal Nutrition, Rowett Research Institute, Bucksburn, Aberdeen. Four times a year, 42s. per volume.
- Pharmaceutical Abstracts*, see *Quarterly Journal of Pharmacy and Pharmacology* above.
- Sugar Abstracts*, see *International Sugar Journal* above.

FUEL *

- Bulletin of the British Coal Utilisation Research Association* (including Abstracts), 13, Grosvenor Gardens, London, S.W.1. Monthly, available to members only.
- Bulletin of the British Coke Research Association*, 11-12, Pall Mall, London, S.W.1. Circulated to members *gratis*.
- Cheap Steam*, 28, Victoria Street, London, S.W.1. Alternate months, 1s., annual subscription 6s.
- Coke and Gas*, 33, Tothill Street, London, S.W.1. Monthly, 2s., annual subscription 20s.
- Coke Oven Managers' Association Bulletin* (including Abstracts of current literature), W. Green, Rosedene, Fitzwilliam Street, Wath-upon-Deane, nr. Rotherham, Yorks. Quarterly.
- Fuel Efficiency News*, Ministry of Fuel and Power (Fuel Efficiency Branch), Queen Anne's Chambers, Dean Farrar Street, London, S.W.1. Monthly, *gratis*.
- Fuel in Science and Practice* (including monthly bibliography), 31, Farnival Street, London, E.C.4. Alternate months, 5s., annual subscription 25s.
- Journal of the Institute of Fuel*, 30, Bramham Gardens, London, S.W.5. Bi-monthly, 10s. (non-members) and 7s. 6d. (members), annual subscription 60s. and 50s. to agents.

* See also Gas, and Electricity.

ABSTRACTS

Atmospheric Pollution Abstracts, Department of Scientific and Industrial Research, Fuel Research Station, Blackwall Lane, East Greenwich, London, S.E.10. Twice a year.

Fuel Abstracts, see *Bulletin of the British Coal Utilisation Research Association* and *Coke Oven Managers' Association Bulletin* above.

Fuel Abstracts, D.S.I.R. Fuel Research Station (H.M.S.O.). Monthly, annual subscription 50s. post free (no single issues).

GAS

Coke and Gas, see *Fuel*.

Gas and Oil Power, 9, Catherine Place, Westminster, London, S.W.1. Monthly, 1s. 3d., annual subscription 20s.

Gas Journal, 11, Bolt Court, Fleet Street, London, E.C.4. Weekly, 1s., annual subscription 45s.

Gas Times, 29, Grove Road, Leighton Buzzard, Beds. Weekly, 1s. 4d., annual subscription 37s. 6d.

Gas World, Bouverie House, 154, Fleet Street, London, E.C.4. Weekly, 9d., annual subscription 36s.

Industrial Gas Times, 29, Grove Road, Leighton Buzzard, Beds. Monthly, 6d., annual subscription 6s.

Transactions of the Institution of Gas Engineers, 1, Grosvenor Place, London, S.W.1. Annually, 25s.

INDUSTRIAL DESIGN

Art and Industry, 66, Chandos Place, London, W.C.2. Monthly, 1s. 6d., annual subscription 18s.

Central Institute of Art and Design Bulletin, 41-42, Dover Street, London, W.1. Quarterly, 2s.

Design Digest, Council of Industrial Design, Tilbury House, Petty France, London, S.W.1. Monthly, *gratis*.

Society of Industrial Artists Bulletin, Room 243, Empire House, St. Martin's le Grand, London, E.C.1. Bi-Monthly. Free to members.

JEWELLERY AND PRECIOUS METALS

Gemmologist, 226, Latymer Court, Hammersmith, London, W.6. Monthly, 10d., annual subscription 10s.

Goldsmiths' Journal, 226, Latymer Court, Hammersmith, London, W.6. Annual subscription 7s. 6d.

Industrial Diamond Review, 226, Latymer Court, Hammersmith, London, W.6. Monthly, 1s., annual subscription 12s.

Jeweller and Metalworker, 10, Albemarle Way, London, E.C.1. Twice a month, 6d., annual subscription 12s. 6d.

Watchmaker and Jeweller, Silversmith, Drury House, Russell Street, London, W.C.2. Monthly, 1s. 6d., annual subscription 15s.

LEATHER

Footwear Organiser, Russell Street, Drury Lane, London, W.C.2. Monthly, 1s. 6d., annual subscription 20s.

Journal of the International Society of Leather Trades Chemists (including Abstracts), "Craigieburn", Duppas Hill Road, Wakefield, Croydon. Monthly, 2s. 6d., annual subscription 30s.

Leather Trades' Review, Bouverie House, Fleet Street, London, E.C.4. Weekly, 1s. 3d., annual subscription 25s.

Leather World, 8, St. Thomas Street, London, S.E.1. Weekly, 2½d., annual subscription 15s. (Monthly technical issue, 1s., inclusive in a.s.).

Monthly Bulletin of the British Boot, Shoe and Allied Trades Research Association, Satra House, Rockingham Road, Kettering, Northants. Monthly, *gratis*, normally for members only.

National Institution of Boot and Shoe Industry (Inc.) Journal, 4, Derngate, Northampton. Quarterly, members only.

ABSTRACTS

Leather Abstracts, see *Journal of the International Society of Leather Trades Chemists* above.

Monthly Digest, British Leather Manufacturers Research Association, 1-6, Nelson Square, London, S.E.1. Available to members only.

METALS AND METALLURGY

Aluminium and Non-Ferrous Review, 25, High Street, Merton, London, S.W.19. Quarterly, subscription only, 10s.

British Steelmaker, 6, Monmouth Street, London, W.C.2. Monthly, 1s. 6d., annual subscription 15s.

Bulletin and Foundry Abstracts of the British Cast Iron Research Association, Alvechurch, Birmingham. Six times per annum, annual subscription only, 15s.

Bulletin of the British Non-Ferrous Metals Research Association, 81-91, Euston Street, London, N.W.1. Monthly, available only to members.

Bulletin of the Institution of Mining and Metallurgy, Salisbury House, London, E.C.2. Monthly, annual subscription only, 60s.

Coil Spring Federation Bulletin, Secretaries: Peat, Marwick, Mitchell & Co., 301, Glossop Road, Sheffield, 10.

Copper Development Association Bulletin, Grand Buildings, Trafalgar Square, London, W.C.2. Bi-annually, gratis. Private circulation only.

Drop Forger, Association of Drop Forgers and Stampers, 245, Grove Lane, Birmingham, 20. Four times a year, 8d., annual subscription 2s. 8d.

Foundry Practice, Long Acre, Nechells, Birmingham, 7. Alternate months, gratis on application.

Foundry Trade Journal, 49, Wellington Street, London, W.C.2. Weekly, 6d., annual subscription 21s.

Iron and Coal Trades Review, 49, Wellington Street, London, W.C.2. Weekly, 9d., annual subscription 40s.

Iron and Steel, Dorset House, Stamford Street, London, S.E.1. Monthly, 1s. 6d., annual subscription 21s.

Journal of the Birmingham Metallurgical Society, 253, Longbridge Lane, Northfield, Birmingham, 31. Quarterly, 2s. 8d., annual subscription 10s. 8d.

Journal of the Institute of British Foundrymen, St. John Street, Chambers Deansgate, Manchester, 3. Bi-monthly, to members only, gratis.

Journal of the Institute of Metals, 4, Grosvenor Gardens, London, S.W.1. Monthly, issued together with *Metallurgical Abstracts*, 7s. 6d., annual subscription 80s.

Journal of the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1. Monthly, 10s., annual subscription 100s., plus postage 8s.

Journal of Research and Development, British Cast Iron Research Association, Alvechurch, Birmingham. Six times per annum, available only to full members.

Light Metals (including Abstracts), Bowling Green Lane, London, E.C.1. Monthly, 2s., annual subscription 26s.

Metal Bulletin, Princes House, 39, Jermyn Street, London, S.W.1. Bi-weekly, annual subscription 100s. post free, home and abroad.

Metal Industry, Dorset House, Stamford Street, London, S.E.1. Weekly, 9d., annual subscription 45s. 6d.

Metal Treatment, 49, Wellington Street, London, W.C.2. Quarterly, 1s. (1s. 4d. post free), annual subscription 5s. (post free).

Metallurgia: The British Journal of Metals (including *Metallurgical Digest*), 31, King Street West, Manchester, 3. Monthly, 2s., annual subscription 24s.

Monthly Statistical Bulletin, British Iron and Steel Federation, Steel House, 11, Tothill Street, London, S.W.1.

Proceedings of the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, 3.

Sheet Metal Industries, 49, Wellington Street, Strand, London, W.C.2. Monthly, 2s., annual subscription 22s. 6d.

The Stabilizer, Lincoln Arc Welding Engineering Service, Welwyn Garden City, Herts. Bi-monthly, gratis.

- Tin and Its Uses*, Tin Research Institute, Fraser Road, Greenford, Middlesex. Quarterly, gratis.
- Tin : Official Monthly Bulletin of the Tin Producers' Association*, 11, Ironmonger Lane, London, E.C.2. Monthly, 1s. 8d., annual subscription 20s.
- Transactions of the Institute of Welding*, 2, Buckingham Palace Gardens, Buckingham Palace Road, London, S.W.1. Alternate months, commencing February, 7s. 6d., annual subscription 30s.
- Transactions of the Institution of Mining and Metallurgy*, Salisbury House, Finsbury Circus, London, E.C.2. Annually, 60s.
- The Welder*, Murex Welding Processes, Waltham Cross, Herts. Quarterly, gratis.
- Welding*, Dorset House, Stamford Street, London, S.E.1. Monthly, 1s. 6d., annual subscription 20s.
- Zinc Bulletin*, Zinc Development Association, Lincoln House, Turl Street, Oxford. Quarterly, gratis.

ABSTRACTS

- Alloy Metals Review* (Abstracts and references), High Speed Steel Alloys, Ltd., Widnes, Lancs. Quarterly, private circulation, gratis to interested inquirers.
- Bulletin of the Iron and Steel Institute*, 4, Grosvenor Gardens, London, S.W.1. Monthly, 2s. 6d., annual subscription to non-members, 30s.
- Foundry Abstracts*, see *Bulletin of the British Cast Iron Research Association* above.
- Iron and Steel Abstracts*, see *Iron and Steel* above.
- Light Metals Abstracts*, see *Light Metals* above.
- Metallurgical Abstracts*, see *Journal of the Institute of Metals* above.
- Metallurgical Digest*, see *Metallurgia* above.
- Nickel Bulletin*, Mond Nickel Co., Ltd., Grosvenor House, Park Lane, London, W.1. Monthly, gratis.
- Non-Ferrous Metals Abstracts*, see *Bulletin of the British Non-Ferrous Metals Research Association* above.
- Z.D.A. Abstract Bulletin*, Zinc Development Association, Lincoln House, Turl Street, Oxford. Monthly, gratis to interested inquirers.

MINING AND QUARRYING

- Bulletin of the Institution of Mining and Metallurgy*, see *Metals*.
- Colliery Engineering*, 33, Tothill Street, London, S.W.1. Monthly, 2s., annual subscription 20s.
- Colliery Guardian and Journal of the Coal and Iron Trades*, 30-31, Farnival Street, London, E.C.4. Weekly, 10d., annual subscription 37s. 6d.
- Mine and Quarry Engineering*, 23, Great Queen Street, London, W.C.2. Monthly, 1s. 6d., annual subscription 18s. post free.
- Mining, Mechanical and Electrical Engineer*, see under *Engineering*.
- Mining Journal*, 15, George Street, Mansion House, London, E.C.4. Weekly, 8d., annual subscription 32s.
- Mining Magazine*, 482, Salisbury House, London Wall, London, E.C.2. Monthly, 1s. 6d. (postage 3d.), annual subscription 16s.
- Mining World and Engineering Record*, 234-36, Gresham House, Old Broad Street, London, E.C.2. Weekly, 6d., annual subscription 21s. (British Isles), 25s. 6d. (foreign).
- Quarry Managers' Journal*, Salisbury Square House, London, E.C.4. Monthly, 1s., annual subscription 12s.
- Science and Art of Mining*, 44, Fleet Street, London, E.C.4. Alternate weeks, 4d. annual subscription 10s. 10d.
- Transactions of the Institution of Mining and Metallurgy*, see *Metals*.
- Transactions of the Institution of Mining Engineers*, Salisbury House, Finsbury Circus, London, E.C.2. Monthly, 10s., annual subscription 120s. post free.

OIL AND PETROLEUM

- Annual Review of Petroleum Technology*, Institute of Petroleum, 22, Portland Place, London, W.1. Irregularly, price varies.
- Gas and Oil Power*, see under *Gas*.
- Journal of the Institute of Petroleum*, 26, Portland Place, London, W.1. Monthly, 7s. 6d., annual subscription 73s. 6d.

Petroleum, 17, Stratford Place, London, W.1. Annual subscription 25s., 3 years 50s.
Petroleum Times, Brettenham House, Lancaster Place, Strand, London, W.C.2.
 Alternate weeks, 2s., annual subscription 45s.

ABSTRACTS

Petroleum Abstracts, see *Journal of the Institute of Petroleum* above.
Petroleum Abstracts of U.S. Government articles, see *Petroleum* above.

PAINTS, OILS AND VARNISHES

Journal of the Oil and Colour Chemists' Association (including Abstracts), W. Heffer & Sons, Cambridge. Monthly, 3s. 6d., annual subscription 40s. (post free).
Oil and Colour Trades Journal, 8, Ludgate Broadway, London, E.C.4. Weekly, annual subscription 25s.
Paint Manufacture, 17, Stratford Place, London, W.1. Monthly, annual subscription, 1 year 25s.; 2 years 40s.; 3 years 50s.
Paint Technology incorporating Synthetic and Applied Finishes (including Abstracts from the world's technical press), 5, Grange Court, Pinner, Middlesex. Monthly, 2s., annual subscription 20s.

ABSTRACTS

Oils and Colours Abstracts, see *Journal of the Oil and Colour Chemists' Association* above.
Paint Abstracts, see *Paint Technology* above.
Review of Current Literature relating to Paint, Colour, Varnish and Allied Industries, Research Association of British Paint, Colour and Varnish Manufacturers, Amberly House, Waldegrave Road, Teddington. Alternate months, 7s. 6d., annual subscription 42s.

PAPER AND PRINTING

British Printer, 2, 3 & 4, Cockspur Street, London, S.W.1. Alternate months, 2s., annual subscription 13s. 6d.
Modern Lithographer and Offset Printer, 37, Norfolk Street, London, W.C.2. Monthly, 1s., annual subscription 10s. (overseas 20s.).
Packaging Review, Old Colony House, South King Street, Manchester, 2. Bimonthly, 1s. 6d., annual subscription 7s. (inland), 8s. 6d. (abroad).
Paper Box and Bag Maker, Graham House, 3, Tudor Street, London, E.C.4. Monthly, 1s., annual subscription 12s. 6d.
Paper Maker (with technical supplement), Graham House, 3, Tudor Street, London, E.C.4. Monthly, 2s., annual subscription 25s.
Paper Making and Paper Selling (incorporating *Paper Making and The Printer*), 24, Bride Lane, London, E.C.4. Quarterly, 2s. 6d., annual subscription 10s.
Patra Journal, Printing and Allied Trades Research Association, Charterhouse Chambers, Charterhouse Square, London, E.C.1. Alternate months, available to members only (gratis).
Printing Review, 46, Chancery Lane, London, W.C.2. Quarterly, 3s. 6d., annual subscription 12s. 6d.
Proceedings of the Technical Section of the Paper Makers' Association, Melbourne House, Alwyck, London, W.C.2. Available to members only.
Process Engravers' Monthly, 2, Embankment Gardens, London, S.W.3. Monthly, 6d., annual subscription 6s. 6d.

ABSTRACTS

Packaging Abstracts, Printing and Allied Trades Research Association, Charterhouse Chambers, Charterhouse Square, London, E.C.2. Monthly, available to members only (gratis).
Paper Makers' Association Technical Bulletin, Melbourne House, Aldwyck, London, W.C.2. Quarterly, annual subscription to non-members 30s.
Printing Abstracts, Printing and Allied Trades Research Association, Charterhouse Chambers, Charterhouse Square, London, E.C.2. Monthly, available only to members (gratis).

PHOTOGRAPHY

British Journal of Photography, 24, Wellington Street, London, W.C.2. Weekly, 4d., annual subscription 21s. 8d.

Journal of the British Kinematograph Society (including technical Abstracts), 2, Dean Street, London, W.1. Monthly (from July 1947), 3s., annual subscription 36s.

Photographic Journal, Section A (pictorial and general), Royal Photographic Society of Great Britain, 16, Princes Gate, Kensington, London, S.W.7. Monthly, 2s., annual subscription 28s. (together with *Photographic Journal, Section B*, which is scientific and technical, 35s.).

Photographic Journal, Section B (scientific and technical), Royal Photographic Society, 16, Princes Gate, London, S.W.7. Bi-monthly, 2s., annual subscription 14s.

ABSTRACTS

Kodak Digest (formerly *Kodak Bulletin*) of *Current Photographic Information*, Kodak Research Laboratories, Wealdstone, Harrow. For conditions of issue apply to the Research Library, Kodak, Ltd.

Motion Picture Abstracts, see *Journal of the British Kinematograph Society* above.

Photographic Abstracts (published by the Scientific and Technical Group of the Society), Royal Photographic Society of Great Britain, 16, Princes Gate, London, S.W.7. Quarterly, 7s. 6d., annual subscription 30s., or 32s. 6d. (printed on one side of the paper only).

PLASTICS

Bakelite Progress, Brackley Lodge, Brackley, Northants. Irregular, gratis.

British Plastics, Dorset House, Stamford Street, London, S.E.1. Monthly, 2s. annual subscription 26s.

Plastics, Bowling Green Lane, London, E.C.1. Monthly, 2s., annual subscription 26s.

Transactions of the Institute of the Plastics Industry, Windsor House, Victoria Street, London, S.W.1. Quarterly, 15s., annual subscription 63s.

ABSTRACTS

Abstracts of the British Plastics Federation, 47-48, Piccadilly, London, W.1. Monthly, 5s. 6d. post free, annual subscription 65s. post free.

RUBBER

India Rubber Journal, Stafford House, Norfolk Street, London, W.C.2. Weekly, 4d., annual subscription 20s.

I.R.I. Transactions, Institution of the Rubber Industry, 12, Whitehall, London, S.W.1. Bi-monthly, 7s. 6d., annual subscription 45s.

Journal of Rubber Research and Summary of Current Literature, Research Association of British Rubber Manufacturers, 105-7, Lansdowne Road, Croydon, Surrey. Monthly, annual subscription only, 250s.

Rubber Age and Synthetics, 147, Grosvenor Road, London, S.W.1. Monthly, 1s. 6d., annual subscription 15s.

Rubber Patent and Trade Mark Review, Research Association of British Rubber Manufacturers, 105, Lansdowne Road, Croydon, Surrey. Monthly, with weekly supplement, 5s. 3d., annual subscription 63s.

ABSTRACTS

Rubber Abstracts, see *Journal of Rubber Research* above.

SOAP, COSMETICS, PERFUMERY, etc.

Perfumery and Essential Oil Record (including Abstracts), 110, Old Broad Street, London, E.C.2. Monthly, 2s. 6d., annual subscription (including year book and diary) 25s.

Soap, Perfumery and Cosmetics, Ludgate House, 24, Bride Lane, London, E.C.4. Monthly, 2s., annual subscription 20s.

ABSTRACTS

Perfumery Abstracts, see *Perfumery and Essential Oil Record* above.

Soap and Perfumery Abstracts, see *Manufacturing Chemist* under General Abstracts.

TEXTILES AND ALLIED PROCESSES

- Ambassador* (incorporating *International Textiles*), 49, Park Lane, London, W.1. Monthly, annual subscriptions from firms outside the U.K. only, 35s.
- Bulletin of the Wool Industries Research Association*, Torridon, Headingley, Leeds, 6. Quarterly, to members only.
- Carpet Review*, 222, Strand, London, W.C.2. Monthly, 2s., annual subscription 20s.
- Cordage, Canvas and Jute World*, 9, Whitburn Street, Bridgnorth, Salop. Monthly, 1s. 8d., annual subscription 20s.
- The Dyer*, Drury House, Russell Street, London, W.C.2. Alternate weeks, 1s. 3d., post free 1s. 6d., annual subscription 20s.
- Empire Cotton Growing Review*, Empire Cotton Growing Corporation, 1A, Harrington Road, London, S.W.7. Quarterly, 1s. 6d., annual subscription 5s.
- Fibres*, 17, Stratford Place, London, W.1. Annual subscription 25s., 3 years, 50s.
- Fibres, Fabrics and Cordage*, 17, Linenhall Street, Belfast. Monthly, 2s., annual subscription 24s.
- Hosiery Times*, 41, Spring Gardens, Manchester. Monthly, 8d., annual subscription 9s.
- International Textiles*, see *Ambassador*.
- Journal of the Institution of British Launderers, Ltd.*, 16-17, Lancaster Gate, London, W.2. Monthly, circulated to members only.
- Journal of the Society of Dyers and Colourists*, 32-34, Piccadilly, Bradford. Monthly, 5s., annual subscription 60s.
- Journal of the Textile Institute* (including Abstracts), St. Mary's Parsonage, Manchester, 3. Monthly, 4s., annual subscription 48s.
- Jute and Canvas Review* (including Abstracts), 222, Strand, London, W.C.2. Monthly, 3s. 6d., annual subscription 40s.
- Lace Research Bulletin*, Lace Federation Research Council, 71, Upper Parliament Street, Nottingham. At intervals, for the use of members only.
- Linen Industry Research Association (circulation of periodicals to members only).
- Power Laundry*, Dorset House, Stamford Street, London, S.E.1. Alternate weeks, 6d., annual subscription 17s. 6d.
- Progress Reports from Experiment Stations*, Empire Cotton Growing Corporation, 1A, Harrington Street, London, S.W.7. Annually, 3s.
- Research Bulletin of the British Cotton Industry Research Association*, Shirley Institute, Didsbury, Manchester. Not on sale for general distribution.
- Review of Work of Experiment Stations*, Empire Cotton Growing Corporation, 1A, Harrington Road, London, S.W.7. Triennially, 2s. each.
- Silk and Rayon*, St. James's House, 44, Brazennose Street, Manchester, 2. Monthly, 2s., annual subscription 20s.
- Silk Journal and Rayon World*, Old Colony House, South King Street, Manchester, 2. Monthly, 1s. 6d., annual subscription 18s.
- Textile Manufacturer*, 31, King Street West, Manchester, 3. Monthly, 1s. 6d., annual subscription 20s.
- Textile Mercury and Argus*, 41, Spring Gardens, Manchester. Weekly, 4d., annual subscription 22s. 6d. Home, 27s. 6d. Abroad.
- Textile Recorder*, Old Colony House, South King Street, Manchester, 2. Monthly, 1s. 6d., annual subscription 26s.
- Textile Weekly*, 33, Blackfriars Street, Manchester, 3. Weekly, 4d., annual subscription 17s. 6d.

ABSTRACTS

- British Cotton Industry Research Association: Summary of Current Literature*, Shirley Institute, Didsbury, Manchester. Alternate weeks.
- Cotton Abstracts*, see *Empire Cotton Growing Review* above.
- Dyeing Abstracts*, see *Journal of the Society of Dyers and Colourists* above.
- Summary of Current Literature, British Cotton Industry Research Association*, Shirley Institute, Didsbury, Manchester. Not on sale for general distribution.
- Summary of Current Literature of the Linen Industry Research Association*. Monthly. *Textile Abstracts*, see *Journal of the Textile Institute* above.
- Wool Digest*, International Wool Secretariat, Dorland House, 18-20, Regent Street, London, S.W.1. Fortnightly, gratis.

WATER AND WATER ENGINEERING

Journal of the Institution of Water Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1. Six times a year, 3s. 6d. each, annual subscription 21s.
Water and Water Engineering (including monthly review of current literature), 30, Fumival Street, London, E.C.4. Monthly, 1s., annual subscription 15s.

ABSTRACTS

Water Abstracts, see *Water and Water Engineering* above.

Water Pollution Research, Summary of Current Literature, Department of Scientific and Industrial Research (H.M.S.O.). Monthly, 2s. (2s. 1d.).

MISCELLANEOUS

Betro Review, British Export Trade Research Organisation, Premier House, 48, Dover Street, London, W.1. Monthly, 1s. 6d., annual subscription 18s. (inclusive of postage by surface mail to all parts of the world).

Forecast, 17, Stratford Place, London, W.1. Monthly, annual subscription, 1 year 40s.; 2 years 60s.; 3 years 80s.

Horological Journal, 226, Latimer Court, London, W.6. Monthly, 10d., annual subscription 10s.

N.I.I.P. News, National Institute of Industrial Psychology, Aldwych House, London, W.C.2. Monthly, members only.

Occupational Psychology, National Institute of Industrial Psychology, Aldwych House, London, W.C.2. Quarterly, 5s., annual subscription 20s.

Quarterly Safety Summary, Association of British Chemical Manufacturers, 166, Piccadilly, London, W.1. Quarterly, 5s., annual subscription 21s. (post free).

Scottish Seaweed Research Association, Ltd., West Mains Road, Edinburgh, 9. Technical reports available to members, prior to publication in various technical and scientific journals.

LIBRARIES AND INFORMATION SERVICES

Government Libraries. Board of Trade Documents Unit (central repository for original German documents collected in connection with British and Allied investigations on German industrial and scientific development).

Board of Trade: Secretariat of the British Intelligence Objectives Sub-Committee (Reference Library and Information Bureau dealing with reports and investigations, British and American, on German scientific and industrial developments).

Department of Scientific and Industrial Research (Information and Intelligence Division, guidance to inquiries freely available, see section *Statements from Government and Public Bodies*).

Patent Office (Library, available to the public for reference only; an almost complete set of patent specifications, covering war-time developments in German industry and research, has been secured for Britain from the Berlin Patent Office, and can be inspected at the Patent Office Library, 25, Southampton Buildings, Chancery Lane, London, W.C.2).

Science Museum and Science Library (National Library of pure and applied science, with over 325,000 volumes, 17,000 scientific and technical periodicals, current and non-current; Information Service based on the card subject-index; bibliographies on special subjects are supplied on request; readers' tickets issued on application without charge; photostats of articles (upon payment); special system of external loans of books to research workers and students, through approved institutions or industrial undertakings carrying out scientific work).

Imperial Institute (Reference Library on the British Commonwealth and its products, open to the general public for reference purposes, 10 a.m. to 5 p.m.; technical advice on products is available).

University Libraries. Brief descriptions of the various university libraries are given in the *Yearbook of the Universities of the British Empire*. (Bell) 1940. 15s. See also section University Laboratories.

Public Libraries. Books which are not directly available in a Public or County Library may usually be borrowed through that library from the National Central Library.

Special Libraries. Many learned societies, professional institutions, research associations, industrial firms and other organisations maintain libraries and information services. Not all of these are available to non-members, but arrangements can sometimes be made for *bona fide* inquirers whose needs cannot be met elsewhere. The Association of Special Libraries and Information Bureaux acts as a co-ordinating body (see section *Statements from Private Organisations*, page 266). It is not possible to list the information services of industrial firms at present, but the names of the Information Officers of certain firms are given in the section *Research Laboratories of Private Firms* where an information service is maintained. The addresses and telephone numbers of the organisations listed below will be found in the *Directory of Organisations*, and fuller statements of their functions in the section *Statements from Private Organisations*.

Aluminium Development Association (Library and Information Service; available to all technical inquirers).

Asphalt Roads Association, Ltd. (Available, as a consultative body, to furnish municipal and county authorities with technical data).

Association of British Chemical Manufacturers (Information on sources of supply of British-made chemicals; available to non-members on inquiry).

Association of Scientific Workers (Information Service: Dr. S. N. Farmer, 6, Redfern Gardens, Romford, Essex; available to members and non-members on payment of one shilling postal charge. Employment Bureau for members and employers).

Association of Special Libraries and Information Bureaux (Aslib) (Library, available to members only; documentary reproduction service). See also statement in section *Statements from Private Organisations*.

Association of Supervisory Electrical Engineers (Library; available to members only).

Atomic Scientists Association (Library; available only through members).

British Association for the Advancement of Science (No Library or Information Bureau, but questions relating to science and its organisation are answered by the Office).

British Boot, Shoe and Allied Trades Research Association (Library and Information Service, primarily for members, but available to other research associations; books sent through the National Central Library on loan).

British Cast Iron Research Association (Library and Information Service; not normally available to non-members, but responsible inquirers would be considered).

British Ceramic Society (Library Service; available to members only).

British Coal Utilisation Research Association (Library and Information Service; mainly for the use of members).

British Colour Council (Reference Library; for the use of members).

British Cotton Industry Research Association (Library and Information Service; available to non-members through the National Central Library or by direct approach; unique collection of cotton, rayon and silk literature).

British Electrical and Allied Industries Research Association (Information Bureau which makes available to members a comprehensive card index of technical information containing some 45,000 subject references and 20,000 author references and published reports; substantial Library, including a lending section for members).

British Electrical Development Association (Information Service; available to non-members).

British Export Trade Research Organisation (Library and Information Service; available to members and, to a limited extent, to firms considering membership; Overseas Trade and Information Reports are issued).

British Food Manufacturing Industries Research Association (Library and Information Service; the library available to non-members on application).

British Institution of Radio Engineers (Library and Information Service; available to members only).

British Internal Combustion Engine Research Association (Library and Information Service; available to members only).

British Kinematograph Society (Library and Information Service).

British Leather Manufacturers Research Association (Library and Information Service; available to members only).

- British Non-Ferrous Metals Research Association (Library and Information Service ; some 5,000 books and more than 20,000 pamphlets, reprints, etc. are freely at the disposal of the staffs of member companies through a loan service. Important papers published are brought to the attention of members at an early date in the monthly *Bulletin* prepared by the Information Department and circulated to members. The Information Department also provides data from published literature on specific questions raised by members, and prepares and distributes translations and reproductions of important foreign papers. Available to members only).
- British Plastics Federation (Library and Information Service ; the latter available to non-members).
- British Pottery Industries Research Association (Library and Information Service ; available to non-members for reference ; library classified under the U.D.C.).
- British Refractories Research Association (Library and Information Service ; availability to non-members is decided on the merits of each case. Translation and photo-copying services are available to members).
- British Road Tar Association (Advisory Service ; technical information at the disposal of the roadmaking industry).
- British Rubber Producers' Research Association (Library ; available to non-members for reference only).
- British Scientific Instrument Research Association (Library and information Service ; available as a courtesy to non-members. Documents may be consulted in the library or borrowed).
- British Shipbuilding Research Association (Library and Information Service ; available to members only).
- British Standards Institution (Library and Information Service).
- British Welding Research Association (Library Service in process of development ; available to members and certain allied professional bodies).
- Cambridge Philosophical Society (Library ; available to non-members on introduction by a member).
- Cement and Concrete Association (Library and Information Service ; literature covering the whole field of cement and concrete, available to non-members for reference purposes only ; reference section of manufacturers' catalogues and names of firms dealing in products, machinery, etc. in connection with cement and concrete ; a comprehensive collection of trade marks and names).
- Chemical Society (Library ; available to Fellows and Members of the chemical and kindred societies ; reference and loan facilities ; Roscoe collection of alchemical and early chemical works ; Nathan collection of works on explosives and firearms ; photostat facilities ; duplicate sets of journals for loan purposes).
- Copper Development Association (Library and Information Service ; services of the technical information bureau are available to all actual or potential users of copper and copper alloys).
- Design Research Unit (Library and Information Service ; for internal use only).
- Engineering Industries Association (Small Technical Library and Information Service, available to members ; also to non-members directly connected with engineering).
- Gas Research Board (Library and Information Service at 144, Cromwell Road, London, S.W.5. ; available to non-members if introduced by a member ; operative exchange with other research bodies).
- Illuminating Engineering Society (Library ; available to members only).
- Imperial Bureau of Dairy Science (Information Service ; available free to dairy research workers and teachers, and advisory and government officials of the British Empire).
- Institute of British Foundrymen (Information Service to members).
- Institute of Chartered Patent Agents (Small Library ; for members only).
- Institute of Marine Engineers (Library and Information Service ; available to non-members upon introduction by a member).
- Institute of Metals (Joint Library of the Iron and Steel Institute and Institute of Metals ; available to members of co-operating societies).
- Institute of Physics, see Physical Society below.
- Institute of the Plastics Industry (Library ; for reference by members).
- Institute of Welding (Library and Information Service ; not usually available to non-members unless by special arrangement).

- Institution of Automobile Engineers (Library and Information Service for members; when possible assistance given to non-members).
- Institution of Chemical Engineers (Library and Register of Independent Consultants; use of library by non-members on the introduction of a member).
- Institution of Civil Engineers (Library and Information Service; not available to non-members except by introduction).
- Institution of Electrical Engineers (Reference Library; available to non-members by arrangement with the Librarian; the Ronalds Library; the Silvanus Thompson Memorial Library; the Oliver Heaviside Collection; and a Lending Library of text-books).
- Institution of Engineers and Shipbuilders in Scotland (Library and Information Service; available to non-members by permission of Council; reference readily, borrowing in special circumstances; microfilm reader available; work in conjunction with West of Scotland Iron and Steel Institute—library in same building, joint catalogue-card; library undertakes searches within staff capacity).
- Institution of Gas Engineers (Library and Information Service; not normally available to non-members).
- Institution of Heating and Ventilating Engineers (Library and Information Service; available for reference purposes to non-members on introduction by a member, or to members of other professional Institutions).
- Institution of Mechanical Engineers (Library; available to members only).
- Institution of Mining and Metallurgy (Library, maintained jointly with the Institution of Mining Engineers; available to *bona fide* inquirers; comprehensive index of periodical literature on economic geology, mining (coal and metalliferous), and extraction metallurgy).
- Institution of Mining Engineers, *see* Institution of Mining and Metallurgy.
- Institution of Municipal and County Engineers (Bureau of Technical Information).
- Institution of Post Office Electrical Engineers (Library and Information Service; available to members only).
- Institution of Production Engineers (Library and Information Service).
- Institution of the Rubber Industry (Services available to members only).
- Institution of Sanitary Engineers (Library and Information Service; available to members only).
- Institution of Water Engineers (Library; available to members only).
- Iodine Educational Bureau (Information and Advisory Services; available to users and potential users of iodine and its compounds, including research workers; medical information given only to profession; scientific and technical papers from world literature on uses of iodine readily available through the Bureau).
- Iron and Steel Institute, *see* Institute of Metals.
- Junior Institution of Engineers (Inc.) (Library and Information Service, available to members only; an Engineers' Register for employment purposes).
- Lace Federation Research Council (Library and Information Service; available to members only).
- Lead Industries Development Council (Information Service; available to all inquirers; technical advice on use of lead and lead alloy pipes and sheet).
- Linen Industry Research Association (Library and Information Service; available to non-members on application through the National Central Library or a Carnegie Library).
- Manchester Joint Research Council (Information Service; for inquirers seeking scientific data affecting their own activities; to put them in touch with the best sources of such information).
- Mineralogical Society (Small library; for use of members only).
- Motor Industry Research Association (Library and Information Service; available to members only).
- National Institute of Industrial Psychology (Lending Library and Information Service available to members; Reference Library to non-members).
- North-East Coast Institution of Engineers and Shipbuilders (Library, available to members only; but non-members may apply through the Northern Regional Library Bureau, Newcastle, or the National Central Library, London).
- Pharmaceutical Society of Great Britain (Library and Information Service; available to non-members for reference only, and on introduction by a member).
- Physical Society (Small Library; for members of the Society and of the Institute of Physics).

- Printing and Allied Trades Research Association (Library and Information Service ; available only to members and other research associations).
- Reinforced Concrete Association (Library and Information Service ; available to non-members on introduction by a member).
- Research Association of British Rubber Manufacturers (Library and Information Service ; available to non-members by special arrangement).
- Royal Institute of Chemistry of Great Britain and Ireland (Library of periodicals and text-books primarily for the use of those preparing for the Institute's examinations, and for reference on professional matters).
- Royal Institution of Great Britain (Reference Library ; for members only).
- Royal Irish Academy (Library ; available for reference only, to non-members on introduction by a member ; photostat available).
- Royal Photographic Society (Library and Information Service ; available to non-members for reference only).
- Royal Society (Library ; available to non-members on introduction by a Fellow ; extensive collection of scientific periodicals, manuscripts and manuscript letters).
- Scottish Seaweed Research Association (Library and Information Service ; available to members and to *bona fide* inquirers).
- Society of Inventors (Library and Information Service ; Library for members only, but general inquiries on inventions welcomed from non-members also).
- Timber Development Association, Ltd. (Library and Information Service ; the Reference Library available to non-members).
- Television Society (Library ; available to members only).
- Tin Research Institute (Library and Service of documentary and practical assistance ; available free to all users of tin).
- Wool Industries Research Association (Library and Information Service ; not available to non-members except by special arrangement ; *Wool Abstracts* supplied for the *Journal of the Textile Institute* ; outlier library of the National Central Library).
- Zinc Development Association (Library and Information Service ; available to *bona fide* inquirers and potential users of zinc. This includes the loan of books as well as careful consideration of any technical problems).

FILMS

THIS list has been completely revised since the last edition. The date of production of each film, where ascertainable, has been inserted after the title. The number given in brackets after the distributor's name is the catalogue reference.

The arrangement of the films by subject is similar to that used for the book-list (*q.v.* page 417) with a few modifications arising from the nature of the material, *e.g.* the inclusion of separate sections on Mining and on Timber, and the placing of certain subjects, *e.g.* Leather under Miscellaneous, when there was not enough material to justify a separate section.

It is emphasised that all inquiries about borrowing, etc., should be addressed to the distributors of the film in question, and not to the publishers of this book. A list of distributors will be found at the end of the section.

GENERAL

Title	Sound(Sd.)	Size	Length	Distributors
	Silent(St.) or Mute			
Atomic Power (1946). A March of Time film	Sd.	16 mm 35 mm	19 mins.	20th Century Fox Film Co., Ltd.
Behaviour of Light. Transmission shadows and eclipses ; explanation of the formation of images by plane, convex and concave mirrors ; the cause of refraction ; illustration of dispersion of light, colour, and the rainbow	St.	16 mm	15 mins.	S.C.F.L. (A67)

Title	Sound(Sd.) Silent(St.) or Mute	Size	Length	Distributors
The Brownian Movement (1943). Exposition of the erratic movements performed by small particles in a suspension	St.	16 mm	4 mins.	S.C.F.L. (B112)
Chemical Work in the Centrifuge Cone (c. 1936). Eurich's centrifuge cone technique in an analysis of a solution of mercury, silver and lead	St.	16 mm	10 mins.	Micro-chemical Club.
Chemical Work on the Microscope Slide (c. 1936). The qualitative microchemical analysis of a solution of mercury, silver and lead, using H. Behrens technique	St.	16 mm	7 mins.	Micro-chemical Club
Colloids. Various aspects of Brownian movement phenomena	St.	16 mm	17 mins.	K.M.L.
Concerning the Crystal. A study of the shapes of crystals of ammonium sulphate. Diagrams and photomicrographs of crystallisation	St.	16 mm	10 mins.	I.C.I.
Crystals. Suitable for teaching purposes	Sd. & Mute	16 mm 35 mm	7 mins.	G.B.E.
Einstein's Theory of Relativity. As simply as possible the film explains the theory, with the help of animated diagrams	St.	16 mm	15 mins.	S.C.F.L. (A563/2)
The Generation of Involute Gear Teeth (1939). Primarily for advanced students; see also A Hypocyclic Motion	St.	16 mm 35 mm	4 mins.	Fairthorne and B.F.I.
Glimpses of Soviet Science (1940). (2) Bullet Top; Artificial Sapphires; Metallisation; Hydroscreen	Sd. Sd.	16 mm 35 mm	10 mins. 10 mins.	W.F.A. Anglo-American Sov.F.A.
(3) Plants in Harmony; Sea Express (sea glider); Steel Skeleton (frame of the Palace of the Soviets). Practical application of general scientific principles	Sd. Sd.	16 mm 35 mm	10 mins. 10 mins.	W.F.A. Anglo-American Sov.F.A.
Historical Introduction to Chemistry. Early beginnings, discovery of oxygen burning by Priestley, and Lavoisier's theories	St.	16 mm	15 mins.	S.C.F.L. (A313)
A Hypocyclic Motion (1938). See also <i>The Generation of Involute Gear Teeth</i>	St.	16 mm 35 mm	9 mins.	Fairthorne and B.F.I.
Land of Invention (pre-1939). Some famous Scottish inventors	Sd.	16 mm	11 mins.	C.F.L. (UK101)
Men of Science. The Royal Institution, and the work of Faraday, showing the bearing of his experiments on modern conditions	Sd.	16 mm 35 mm	33 mins.	C.O.I.
Mouvements Vibratoires (c. 1932). An analysis of simple harmonic motion by diagrams and models	St.	16 mm 35 mm	12 mins.	B.F.I.
Rates of Change (1937). The differential calculus; the exposition makes use of the visual for clarity	St.	16 mm	9 mins.	E.G.S.
Surface Tension. Experiments to prove surface tension of liquids	Sd.	16 mm	2 reels	B.I.F. (551)

<i>Title</i>	<i>Sound (Sd.) Silent (St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Surface Tension Experiments (1942). (not available outside Scotland except by special arrangement). Not the same film as the above	St.	16 mm	5 mins.	S.C.F.L. (A583)
They Met in London (1941). British Association Meeting to further the use of science in war and peace; for general audiences	Sd.	16 mm 35 mm	12 mins.	C.F.L. (V200)
Universities at War (1945). The work of Canadian scientists and technicians	Sd.	16 mm 35 mm	20 mins.	C.F.L. (C229)

BUILDING AND CONSTRUCTIONAL MATERIALS *

Asphalt for Buildings	St.	16 mm	15 mins.	N.A.M.M.C.
Asphalt in Building Construction	St.	16 mm	35 mins.	N.A.M.M.C.
Asphalt and Fire Resistance	St.	16 mm	11 mins.	N.A.M.M.C.
Asphalt Lake. Use in road-making and roofing; processes in refining of asphalt	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F704)
Bricks. How bricks are made from clay and used in building	St.	16 mm	10 mins.	E.G.S. (L142)
City Rises Overnight (1942). Erection of prefabricated houses by planned construction of the sections in the factory and use of Homasote fibre board. In colour. (Made in U.S.A.)	Sd.	16 mm	60 mins.	T.D.A.
Concrete Mixing	St.	16 mm	8 mins.	D.S.I.R.
Glass Bricks, <i>see</i> under Ceramics and Glass				
Guernsey Granite. From rock blasting to preparation of granite for building, road construction, etc.	St.	16 mm	30 mins.	E.G.S. (A29)
Keeping the Water Out	St.	16 mm	8 mins.	N.A.M.M.C.
Limestone and Marble. The relationship between limestone, chalk and marble, and their industrial uses	St.	16 mm	15 mins.	S.C.F.L. (A329)
Making a Lath and Plaster Ceiling	St.	16 mm	8 mins.	D.S.I.R.
Orlit. On the method of sectional house construction	Sd.	16 mm 35 mm	20 mins.	W.F.A.
Seco. Development of Seco Unit System of prefabricated building construction. Manufacture of components and erection	Sd.	16 mm	25 mins.	T.D.A.
Slate. The quarry, splitting and shaping the slates; uses	St.	16 mm	10 mins.	E.G.S. (L143)
The Use of the Land (1937). Limestone quarrying, uses of product, types of blasting, kiln and transport. (In north-west Derbyshire)	St.	16 mm	14 mins.	D.H.
A Vouissioir Arch	St.	16 mm	15 mins.	D.S.I.R.

CERAMICS AND GLASS

Les Arts du Feu (1946). How fire is used by French craftsmen in the creation of delicate pottery, glassware, etc. (<i>In French</i>)	Sd.	16 mm	12 mins.	F.O.I.
Bricks, <i>see</i> under Building Materials				

* *See also* Engineering, Metals, and Timber

<i>Title</i>	<i>Sound (Sd.) Silent (St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
China Clay. Showing the how and why of pottery	Sd.	16 mm 35 mm	20 mins.	W.F.A.
Glass	Sd.	35 mm	18 mins.	Radio
Glass Blowing. Glass tubing is softened in the flame of the blowlamp and drawn out or blown into various shapes	St.	16 mm	5 mins.	E.G.S. (L150)
Glass Bricks	Sd.	16 mm	10 mins.	Pilkington
Glass Making	Sd.	16 mm	20 mins.	Powell
Looking Through Glass (1943). Glass manufacture and research work at the Sheffield Department of Glass Technology; for general audiences	Sd.	16 mm 35 mm	17 mins.	C.F.L. (UK120)
Making China	St.	16 mm	12 mins.	B.F.I.
Making a Mirror. Various stages from cutting the glass to cleaning the finished mirror	St.	16 mm	5 mins.	E.G.S. (L147)
Making of Stained Glass	St.	16 mm	15 mins.	Powell
Manufacture of Crystal Glass	St.	16 mm	15 mins.	Stuart
Sand and Clay. In conjunction with the film <i>Limestone and Marble, q.v.</i> under Building and Constructional Materials, follows the Rocksoil cycle and the commercial significance of the minerals involved	St.	16 mm	15 mins.	S.C.F.L. (A330)
Sheet Glass	Sd.	16 mm	25 mins.	Pilkington
Vitrolite	Sd.	16 mm 35 mm	42 mins.	Pilkington

ELECTRICITY AND ELECTRICAL ENGINEERING

Beauty Enriched by Light. Production of the Mazda Lamp in all its stages	Sd.	16 mm	15 mins.	B.T.H.
Cathode Ray Oscillograph. The work of the cathode ray oscillograph and its use in electrical and radio research	Sd.	16 mm 35 mm	20 mins.	G.B.E. (F2530)
Chemical Effects of Electricity. The action of two electrodes in an electrolytic bath is traced from the experiments of Volta to modern battery manufacture, electroplating, electrotyping, the metallurgy of copper and aluminium, etc.	St.	16 mm	15 mins.	S.C.F.L. (A52)
Electric Tools (1946). Construction and operation of electric tools including a hammer, grinder, blower and valve refacer. With a commentary; in colour	Sd.	16 mm	22 mins.	Wolf
Electro-Magnets. Principles and practical applications of the electro-magnet	St.	16 mm	22 mins.	S.C.F.L. (A360/2)
Electronics in Industry (1946). Survey of the firm's Electronics Engineering Department, dealing mainly with applications including the control of motors, generators and resistance welders	Sd.			B.T.H.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Electroplating Today. Process and uses	St.	16 mm	1 reel	R. W. Proffitt
Faraday's Lines of Force. Shows diagrammatically the variations in direction and strength of an electric field created by two approaching and receding conductor spheres	St.	16 mm	8 mins.	S.C.F.L. (A395)
Glaciers and Their Uses. How glaciers can be made a cheap means of obtaining electricity	St.	9.5 mm	10 mins.	Heaton (SB872)
Heat and Light from Electricity. Series, parallel circuits, Ohm's law, and the manufacture and use of conductors, insulators and lamps; arc furnaces and heating equipment	St.	16 mm	15 mins.	S.C.F.L. (A493)
How Talkies Talk. Technical details of sound recording and reproduction	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F546) S.C.F.L. (A347)
How the Telephone Works (1937)	Sd.	16 mm 35 mm	9 mins.	C.F.L. (674)
Illumination. Methods of lighting; the photometer and foot-candle meter; glare; the nature of direct and indirect lighting systems	St.	16 mm	15 mins.	S.C.F.L. (A459)
Induced Currents. The principle of electro-magnetic induction applied to commercial generators; A.C. and D.C.; the action of commutator and transformer; principle of the telephone	St.	16 mm	15 mins.	S.C.F.L. (A209)
Inside the Telephone. Silent version of <i>How the Telephone Works, q.v.</i>	St.	16 mm 35 mm	12 mins.	C.F.L. (676)
Magnetic Effects of Electricity. Application of magnetism and magnetic induction to the electro-magnet, electric bell, the ammeter, the voltmeter and the motor. Includes an explanation of terrestrial magnetism	St.	16 mm	15 mins.	S.C.F.L. (A56)
The Microphone. Types of carbon microphones, ribbon microphones, their structure and function	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F701)
A Modern Miracle (pre-1939). Story of communications and the development of modern telecommunications	Sd.	16 mm	23 mins.	C.F.L. (BE24)
Planned Electrification, see Mining Power and Electricity. Modern power stations and the construction of the grid	Sd.	16 mm	18 mins.	B.E.D.A.
Power Lines. Manufacture of cables for transmitting electric power	Sd.	16 mm 35 mm	18 mins.	C.O.I.
Power in Store	Sd.	16 mm 35 mm	20 mins.	Lucas
Radar (1945). Newsreel report on wartime development and uses of Radar. Produced by Universal News	Sd.	16 mm 35 mm	8 mins.	C.F.L. (V241)
Radio. The principle of wireless transmission and reception, explained by diagrams	St.	16 mm	50 mins.	S.C.F.L. (A513/5)
Servant of Mankind. The story of Thomas Edison and his inventions	Sd.	16 mm	9 mins.	M.G.M.

Title	Sound(Sd.) Silent(St.) or Mute	Size	Length	Distributors
Simple Magnetism and Electricity (c. 1936). Properties of magnets; electro-statics; accumulators; lamp circuits; galvanometers; principles of the telephone. (G.P.O. Film Unit)	Sd.	16 mm 35 mm	15 mins.	C.F.L. (GPO651)
Testing of Flame-proof Electrical Equipment , <i>see</i> under Mining				

ENGINEERING

Ace of Blades (1944). Manufacture of propeller blades; in colour	Sd.	16 mm	30 mins.	Airscrew
Aircraft Design . National Physical. Laboratory work on light alloys and steels; wind tunnel tests; rotary arm tests	Sd.	35 mm 16 mm	10 mins.	G.B.E. (F596)
Airscrew (1940). The production of airscrews	Sd.	35 mm 16 mm	20 mins.	C.F.L. & P.F.B. (UK220)
American Shipbuilding Skills : in 10 parts	Sd.	16 mm	16 mins. each part generally available)	M.O.S. (not generally available)
Auto-Biography (1938). The growth of a car from the smelting of iron to the finished car driving off the conveyer	Sd.	16 mm 35 mm	12 mins. 12 mins.	Ford (B121/71) Ford (A121/71)
	St.	16 mm	27 mins.	Ford (C216/71)
Boulder Dam . With 27 lantern slides	St.	16 mm	60 mins.	Inst.C.E.
Bridge Testing	St.	16 mm	15 mins.	D.S.I.R.
B.T.H. Magneto . A typical magneto's design and production	Sd.	16 mm	20 mins.	B.T.H.
Building Britain's Dependable Car	Sd.	16 mm	12 mins.	Austin
The Building of a Dock . Silent version of <i>Dry Dock</i> (q.v.)	St.	—	10 mins.	G.B.E. (FS751)
The Building of a Liner . <i>See Shipyard</i>	St.	16 mm	10 mins.	G.B.E. (FS750)
Building of the New Tyne Bridge	St.	16 mm	30 mins.	Dorman Long
By the Water's Edge (1935). Unusual and difficult operations in the engineering shops at the Ford Works at Dagenham	Sd.	35 mm	20 mins.	Ford (A107/36)
	St.	16 mm	34 mins.	Ford (C206/36)
Civil Engineering (c. 1946). Types of jobs; building a new power-station shown in detail	Sd.	16 mm 35 mm	15 mins.	C.F.L. (UK845)
Clydebuilt (1943). Welding, riveting, prefabrication in the construction of a ship	Sd.	16 mm 35 mm	23 mins.	C.F.L. (UK502)
The Compression Ignition Engine : Four-stroke Cycle . A silent version of <i>First Principles of the Compression Ignition Engine</i> (q.v.)	St.	16 mm 35 mm	8 mins.	P.F.B. S.C.F.I. (C12)
Dependable Power	Sd. St.	16 mm	12 mins.	Austin
Dry Dock . The building of a dock and the repair of a liner from start to finish. (<i>See also The Building of a Dock</i> , a silent version of the above)	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F663)
Engineering in War and Peace (1946). The fundamental jobs in engineering, and its wide scope	Sd.	16 mm 35 mm	22 mins.	C.F.L. (UK810)

Title	Sound(Sd.) Silent(St.) or Mute	Size	Length	Distributors
The Failure of the Tacoma Narrows Bridge (1940). A unique record of the failure of the great suspension bridge in U.S.A. Faults in design examined by means of a model	St.	16 mm	25 mins.	Inst.C.E.
First Principles of the Compression Ignition Engine (1937). Explained by diagrams and models; <i>see also The Compression Ignition Engine</i>	Sd.	16 mm 35 mm	5 mins.	P.F.B.
First Principles of Lubrication (1937.) The theory and practice of lubrication by means of diagrams and models; <i>see also Lubrication</i>	Sd.	16 mm 35 mm	6 mins.	P.F.B.
	St.	16 mm	6 mins.	P.F.B.
First Principles of the Petrol Engine (1937). Expounds on the four-stroke cycle of the internal combustion engine; <i>see also The Internal Combustion Engine</i>	Sd.	16 mm 35 mm	10 mins.	P.F.B.
	St.	16 mm	10 mins.	P.F.B.
Four-Stroke Cycle Petrol Engine. On the four-stroke cycle motor, fuel system of a petrol engine, ignition system, and cooling system	St.	16 mm	15 mins.	S.C.F.L. (A28)
How the Motor Car Engine Works (1946). Cartoon and diagram illustrate the four-stroke internal combustion engine. Produced by Ford Motors	Sd.	16 mm 35 mm	15 mins.	C.F.L. (UK742)
Hull Design. The marine research work of the National Physical Laboratory in testing prospective vessels by means of models made in exact details from architects' plans	Sd & Mute	16 mm 35 mm	10 mins.	G.B.E. (F597)
Hydraulics (1941). Introduction to the general principles of hydraulics and their application	Sd.	16 mm 35 mm	13 mins.	P.F.B.
The Internal Combustion Engine : Four-Stroke Cycle (1936). A condensed silent version of <i>First Principles of the Petrol Engine (q.v.)</i>	St.	16 mm	12 mins.	S.C.F.L. (C11) also P.F.B.
Lubrication. A condensed silent version of <i>First Principles of Lubrication and Lubrication of the Petrol Engine (q.v.)</i>	St.	16 mm 35 mm	10 mins.	P.F.B. S.C.F.L. (C24)
Lubrication of the Petrol Engine (1937). As applied to the automobile engine	Sd.	16 mm 35 mm	14 mins.	P.F.B.
Manufacture of Leyland Motors	St.	16 mm	45 mins.	Leyland
Methods of Aeronautical Research : Parts 1 and 3. For general audiences	St.	16 mm	10 mins.	R.A.S.
Power	Sd.	16 mm	18 mins.	Morris
Power to Order. Railway engine in boiler shop, machine shop and assembly shop	Sd.	16 mm 35 mm	11 mins.	C.O.I.
Precision. The measuring room in the B.T.H. works and the various measuring devices	Sd.	16 mm	8 mins.	B.T.H.
Precision and Practice (1936). Precision work in the making of Ford cars, and some of the tests performed on them	Sd. Sd. St.	16 mm 35 mm 16 mm	18 mins. 18 mins. 34 mins.	Ford (B113/50) Ford (A113/50) Ford (C211/50)

<i>Title</i>	<i>Sound(Sd.) Silent(Si.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Production Perfected	Sd.	16 mm	18 mins.	Morris
Propeller Making. Operations in the making of a propeller with views of propellers on ships and a ship's launching	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F526)
Refrigeration. Natural ice; commercial and household refrigeration	St.	16 mm	16 mins.	S.C.F.L. (A29)
Road Testing Machines	St.	16 mm	13 mins.	D.S.I.R.
Romance of Engineering (c. 1937). A history of a steel works, depicting the various manufacturing processes	Sd.	16 mm 35 mm	35 mins.	Beardmore
Science Invention Progress. Developments in mechanical sciences including aeronautics, radio and ship-building	Sd.	16 mm 35 mm	20 mins.	G.B.E. (F631)
Shipyard. The building of the <i>Orion</i> at Barrow and its launching; for non-specialised audiences. <i>See The Building of a Liner</i>	Sd.	16 mm 35 mm	20 mins.	G.B.E. (F577)
Springs (1938). Suspension system of the motor car; principles of the leaf spring, independent suspension, shock absorbers	Sd.	16 mm 35 mm	15 mins.	P.F.B.
Steam Power. Early steam engines, the steamboat, modern engines and boilers	St.	16 mm	15 mins.	S.C.F.L. (A66)
Sydney Harbour Bridge	St.	16 mm	90 mins.	Dorman Long
They're Everywhere (1947). A film of the works and of the production of nuts, bolts and screws	Sd.	16 mm 35 mm	40 mins.	G.K.N.
Transfer of Power (1940). Iron and steel, steam and petroleum, are shown as playing a part in the story of the transfer of power	Sd.	16 mm 35 mm	22 mins.	P.F.B.
Vision and Foresight (to be completed in 1947). The manufacture of engineering accessories of different kinds	Sd.	16 mm	22 mins.	G.B.E.
Visualised Aerodynamics. Experiments carried out in Dresden by Hippiisch; for specialised audiences	St.	16 mm	40 mins.	R.A.S.

FOOD AND DRUGS

Barley for Ales and Stout. Harvesting and distribution; manufactured products	St.	16 mm	10 mins.	S.C.F.L. (A105)
Bread Bakery and Confectionery (1939). Methods of work in the U.S.S.R. (American commentary)	Sd.	16 mm 35 mm	12 mins.	Sov.F.A.
Brewsters Magic (1932). The life-history of the hop, with methods of production of malt and the use of yeast	Sd.	16 mm	10 mins.	B.I.F. (501)
Canning (1938). As a method for dealing with surplus supplies of fish. (Swedish setting)	St.	16 mm	12 mins.	E.G.S. & D.H. (4161)
Chocolate Making	St.	16 mm	15 mins.	Cadbury
Cocos Making	St.	16 mm	15 mins.	Cadbury

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Fishing Partners (1945). Research on cod, for better catches, and better methods in drying and marketing, carried out by the Biological Station of the University of Laval and the Fisheries Research Board of Canada respectively	Sd.	35 mm	18 mins.	N.F.B.C.
Food from Straw (1942). On cattle feed obtained from straw pulp, its preparation and nutritive content (I.C.I.)	Sd.	16 mm 35 mm	6 mins.	C.F.L. (UK331)
From Wheat to Bread. American scenes; the making of flour and of bread	St.	16 mm	15 mins.	S.C.F.L. (A16)
Home of Horlicks. Running of a large factory; scientific research	Sd.	16 mm	20 mins.	E.G.S. (S293)
Hops for Beer. Hop growing; uses for brewing and medicinal purposes	St.	16 mm	10 mins.	S.C.F.L. (A106)
It Takes the Biscuit. The way biscuits are made	Sd.	16 mm 35 mm	20 mins.	W.F.A.
L'Institut Pasteur (1942). Pasteur's original work, and that carried out today; French commentary	Sd.	16 mm 35 mm	20 mins.	F.O.I.
Making of Milk Chocolate Bars	St.	16 mm	15 mins.	Cadbury
Meat Packing. Dressing, inspection and curing of beef (U.S.A.)	St.	16 mm	1 reel	R. W. Proffitt
Moulds and Yeasts. Moving diagrams show the common pin mould in growth; yeast budding in bread making	St.	16 mm	9 mins.	K.M.L.
Penicillin (1945). The story of how the drug was discovered, and its subsequent large-scale use in the war. Produced by I.C.I.	Sd.	16 mm 35 mm	20 mins.	C.F.L. (UK735)
Sugar (1934). Growing and processing of cane sugar in tropical Queensland	Sd.	35 mm	8 mins.	A.N.I.B.
Talking of Tea. Produced for the Tea Marketing Board	Sd.	16 mm	10 mins.	G.B.E. (G2731)
Tea from Nyasaland (c.1946). Nyasaland tea from the first stages of its growing to retail distribution	Sd.	16 mm 35 mm	9 mins.	C.F.L. (CE224)
Time for Tea. The growing and manufacture of tea	Sd.	35 mm	20 mins.	Paramount
Wheat into Bread. Cultivation, harvesting, milling of wheat	St.	16 mm	10 mins.	S.C.F.L. (A104)
Yes We Can (1938). The canning of fruit in Australia by machinery	Sd.	35 mm	6 mins.	A.N.I.B.

FUEL *

Boiler House Practice (1943). Fuel economy, intended for workers—methods of firing, sources of waste. <i>See also Steam</i>	Sd.	16 mm 35 mm	26 mins.	C.F.L. (UK445)
Cleaning Fine Coal	St.	16 mm	8 mins.	D.S.I.R.
Coal Breaking	St.	16 mm	28 mins.	D.S.I.R.

* *See also Mining, and Oil and Petroleum*

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Fire Making. Pure oxygen supporting rapid combustion; the kindling point of several substances; the history of matches, and their modern manufacture	St.	16 mm	15 mins.	S.C.F.L. (A544)
Furnace Practice (1946). Fuel economy, for plant managers and furnacemen. For the Ministry of Fuel and Power	Sd.	16 mm 35 mm	30 mins.	C.F.L. (UK746)
Hot Air Heating. Fireplace and stove, and the hot air system in a large modern building	St.	16 mm	15 mins.	S.C.F.L. (A24)
The Manufacture of Gas (1937). A detailed description of methods used in converting coal into gas, and how by-products are arrived at	Sd. St.	16 mm 35 mm 16 mm	15 mins.	B.G.C.
Pulverised Fuel for Boilers	St.	16 mm	11 mins.	D.S.I.R.
Reduction of a Gross Sample of Coal to Laboratory Size	St.	16 mm	8 mins.	D.S.I.R.
Research on Heating Somerset Peat (1945). How peat is formed, and methods used in the district for cutting and drying; uses of peat in industry and agriculture	St. St.	16 mm 16 mm	8 mins. 15 mins.	D.S.I.R. D.H.
Steam (1944). How to minimise waste in the use of steam in the boiler house, shown in practical manner	Sd.	16 mm 35 mm	20 mins.	C.F.L. (UK588)

INSTRUMENTS

Kelvin, Master of Measurement (1946). Work of Lord Kelvin on the marine compass, depth-sounding apparatus, tide predictor, mirror galvanometer and syphon recorder	Sd.	16 mm 35 mm		Marine Instruments
Lenses. Animation methods used to show lens refraction; convex and concave lens; achromatic lenses	St.	16 mm	15 mins.	S.C.F.L. (A562)
The Microscope (1946). For sixth forms and first year University students	Sd.	16 mm 35 mm	11 mins.	Realist Film U
Optical Instruments. The principles of the eye, spectacle lenses, the camera, stereopticon, moving picture projectors, microscopes and telescopes	St.	16 mm	15 mins.	S.C.F.L. (A314)

METALS AND WELDING

Aluminium—Mine to Metal. Mining of bauxite, treatment of ore, extraction of the pure aluminium	Sd.	16 mm	20 mins.	A.D.A.
Application of Oxygen in Steelworks (1938). Steel manufacture from "scrap" to "billets"; maintenance work with oxy-acetylene blowpipe; descaling, and use of the oxygen lance	St.	16 mm	29 mins.	B.O.C.
Automatic Oxygen Cutting Machine (prior to 1936). Some details of its manufacture, testing and use	St.	16 mm	28 mins.	B.O.C.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Blanking and Piercing of Aluminium (1941). Description of the punch and die material; automatic feeding; shearing operations; routing machines; the rubber press. (Made in U.S.A.)	Sd.	16 mm	15 mins.	A.D.A.
British Steel. A symposium of its uses	St.	16 mm	12 mins.	S.C.F.L. (A573)
Bronze Welding of Cast Iron (1937) Seven different operations in jointing and repairing	St.	16 mm	34 mins.	B.O.C.
Bronze Welding of Light Gauge Copper Tubing. Bronze-welded fittings in sanitary, plumbing and heating installations	St.	16 mm	44 mins.	B.O.C.
Cast Iron Welding (c. 1936). Repairing fractured and worn castings with the oxy-acetylene blowpipe	St.	16 mm	15 mins.	B.O.C.
Casting of Hyduminium Aluminium Alloys	Sd.	35 mm 16 mm	45 mins.	H.D.A.
Construction of Excavating Machines. Fabricating excavators by means of oxy-acetylene machine cutting and electric welding	St.	16 mm	14 mins.	B.O.C.
Copper. (Copper Development Association loans 16 mm films, sound and silent, dealing with the production and fabrication of copper)				
Copper	St.	16 mm	30 mins.	Yorkshire Copper Works
Depositing Stellite with the Oxy-acetylene Flame (1937). With typical applications	St.	16 mm	19 mins.	B.O.C.
Diamet Inspected Steel	St.	16 mm	30 mins.	U.S.C.
Die Castings	Sd.	16 mm	30 mins.	Nat. Alloys
Drawing, Stretching and Stamping (1941). Operations of a draw press and a stretch press; stamping, coining and embossing; tools described. (Made in U.S.A.)	Sd.	16 mm	23 mins.	A.D.A.
Elementary Oxy-acetylene Welding (1937). Comparison of correct and incorrect procedures	St.	16 mm	46 mins.	B.O.C.
Empire of Steel	Sd.	16 mm	55 mins.	Waygood- Otis
Fabricating Processes (1941). Aluminium alloys. Detailed processes shown; laboratory work on methods of working, fabricating, protection, etc. (Made in U.S.A.)	Sd.	16 mm	20 mins.	A.D.A.
Fabrication of Electrolux Refrigerators by Oxy-acetylene Welding	St.	16 mm	37 mins.	B.O.C.
Fabrication of Steel Parts. Bell crank and spur wheel fabricated by oxygen machine cutting and electric welding	St.	16 mm	9 mins.	B.O.C.
Forgings in Hyduminium Aluminium Alloys	Sd.	16 mm 35 mm	35 mins.	H.D.A.
Frodingham Hirsch Sheet Metal Piling	St.	16 mm	10 mins.	U.S.C.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
From Gold Ore to Bullion (1937). Details of three processes of refining gold ore: all-cyanide process, flotation cyanide process, amalgamation process	Sd.	16 mm	28 mins.	N.F.B.C.
From Iron Ore to Pig Iron. Methods of obtaining iron ore from open pit mine; loading and unloading machinery; the casting machine. (U.S.A.)	St.	16 mm	15 mins.	S.C.F.L. (A53)
From Pig Iron to Steel. Progress of the ore through open hearth furnace, "Blooming" mill and finishing mill	St.	16 mm	15 mins.	S.C.F.L. (A64)
From Raw Material to Finished Product	St.	16 mm	30 mins.	Dorman Long
From Sheets of Steel	Sd.	16 mm	10 mins.	Austin
Furnaces of Industry (1940). The manufacture of steel alloys; the various operations; metallurgical research work	Sd.	16 mm 35 mm	12 mins.	C.F.L. (UK217)
General Sheet Metal Practice (1941). Description of alloys; various forming operations; simple bending, principles of hand-forming; roll forming machinery. (Made in U.S.A.)	Sd.	16 mm	20 mins.	A.D.A.
Gold. Dredging, hydraulic and shaft mining; smelting of quartz; many uses to which gold is put	St.	16 mm	15 mins.	S.C.F.L. (A23)
Great Canadian Shield (1945). The geological foundations, leading to a review of the area's mineral wealth and the several uses in industry of gold, nickel, mica, feldspar, magnesium, etc.; in colour	Sd.	16 mm	12 mins.	N.F.B.C.
Heat Treatment of High-Speed Tool Steels	Sd.	16 mm 35 mm	15 mins.	Edgar Allen & Co.
Heat-Treatment of Wrought Aluminium Alloys (1946). Natural and artificial hardening of alloys; heat-treatment plant; production of sheets	Sd.	16 mm 35 mm	18 mins.	A.D.A.
Heavy Industries. Pig iron in the furnaces; being poured into moulds for castings; uses of steel in engineering shops and shipyards	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F648)
How to File (1944). A not-too-advanced instructional film, for specific audiences, on the technique of filing metals	Sd.	16 mm 35 mm	7 mins.	P.F.B.
How to Machine Aluminium (1941). Types of alloys, merits of steel tools and carbide-tip tools, rates of speeds and feeds. (Made in U.S.A.)	Sd.	16 mm 35 mm	30 mins.	A.D.A.
How to Rivet Aluminium (1941). Manufacture of rivets, methods of riveting, choice of rivets. (Made in U.S.A.)	Sd.	16 mm 35 mm	30 mins.	A.D.A.
How to Weld Aluminium (1941). Oxy-acetylene welding, technique of arc welding, spot welding. (Made in U.S.A.)	Sd.	16 mm 35 mm	40 mins.	A.D.A.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Inside of Arc Welding (c. 1942). In six parts, telling the story of how arc welding appliances may be used; in colour, with cartoon sequence. (Ministry of Supply Advisory Service on Welding)	Sd.	16 mm	60 mins. (10 mins. each part)	C.F.L. (AD20) M.O.S.
Iron. Smelting of iron ore; moulds; pig-iron	St.	16 mm 35 mm	10 mins.	G.B.E. (F748)
Iron and Steel (1947). Principal aspects and processes of iron and steel making; a recruitment film	Sd.	16 mm 35 mm	30 mins.	B.I.S.F.
Lead. Mining and smelting, its uses in industry, the "Dutch Boy" method of making white lead	St.	16 mm	15 mins.	S.C.F.L. (A204)
Locomotive Copper Firebox Welding. Repair and welding-in	St.	16 mm	9 mins.	B.O.C.
Magic in Metal	Sd.	16 mm	20 mins.	Morris
Magic Wand of Industry—Arc Welding (1946). A record (in colour) of the ways in which the Arc Welding Process was used in the war. Produced at the request of the U.S. Bureau of Mines	Sd.	16 mm	25 mins.	Lincoln
Magie du Fer Blanc (1937). The story of canning fruit, sardines and milk, from the manufacture of tins to the distribution of the finished cans. The sound version has a musical background; English captions to both. (Also known as <i>The Wonders of Tinplate</i>)	Sd. St.	16 mm 35 mm 16 mm	35 mins.	T.R.I.
Making of Appleby Plates	St.	16 mm	15 mins.	U.S.C.
Making Locomotive Wheels	St.	16 mm	15 mins.	Armstrong- Vickers
Manufacture of Edge Tools	St.	16 mm	12 mins.	Marples
Manufacture of Sheet Zinc	St.	16 mm	20 mins.	Z.D.A.
Manufacture of Tool Steels and Small Tools (1936). Processes up to the production of various engineers' tools such as twist drills and milling cutters	St.	16 mm	15 mins.	Firth Brown
Manufacture and Use of "Phoenix" Rapid Machining Steel	St.	16 mm	60 mins.	U.S.C.
Mass Production of Aluminium Air Cooled Cylinder Heads (1944). Made by the Caterpillar Tractor Co. of U.S.A.	Sd.	16 mm	30 mins.	I.B.F. one copy
Mastery of Steel	Sd.	16 mm	20 mins.	Morris
Mining of Hematite Ore at Beckermert, Cumberland	St.	16 mm	15 mins.	U.S.C.
Mitia (1946). Manufacture of "Mitia" carbide hard metal tips and cutting tools. In Kodachrome	St.	16 mm	36 mins.	Firth Brown
Modern Steelcraft (1936). For the specialised audience; a tour of the works of Messrs. Thomas Firth and John Brown following in detail the many processes involved. Written commentary provided	St.	16 mm	50 mins.	Firth Brown

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Nitralloy Steel (1936). Characteristics of nitrogen-hardening steels and their uses in industry	St.	16 mm	10 mins.	Firth Brown
Oxy-acetylene (Prior to 1936). Examples of the use of blowpipe for welding and cutting; suitable for first-year students	St.	16 mm	26 mins.	B.O.C.
Oxy-acetylene Welding as Applied to Railway Track Work (1937). In 5 reels; 1. Bonding, etc. 2. Resurfacing a worn crossing 3, 4. A fuller exposition of 2 5. Further applications of 1	St.	16 mm	16 mins. 18 mins. 24 mins. 8 mins.	B.O.C.
Oxy-acetylene Welding in Automobile Engineering (1938). Repair work, and types of jobs commonly met with	St.	16 mm	23 mins.	B.O.C.
The Oxy-acetylene Welding of Non-Ferrous Metals (c. 1935). Construction of an aluminium tank and a large copper distillery kettle	St.	16 mm	14 mins.	B.O.C.
Oxygen Cutting: Some Industrial Applications (c. 1935). In 2 parts; 1. Cutting a Ship in Two. 2. Oxygen Cutting by Automatic Machine	St.	16 mm	16 mins. each	B.O.C.
Pewter . Manufacture of pewter and the uses to which it is put	Sd.	16 mm 35 mm	20 mins.	W.F.A.
Pipe Welding (1935). 1. Welding the hot water piping installation at the B.O.C. 2. Welding a high pressure pipeline; welding an 8 in. pipe joint by the Lindewelding technique	St.	16 mm	10 mins. and 16 mins.	B.O.C.
Power from Shipshaw (1946). The harnessing of water power in the Canadian Saguenay Valley for the manufacture of light-weight metals; war and peacetime uses of aluminium	Sd.	16 mm	9 mins.	N.F.B.C.
Prevention and Control of Distortion in Arc Welding (1946). The problem of distortion set up in Arc welded structures; produced in conjunction with Walt Disney Productions, in colour	Sd.	16 mm		Lincoln
Production in Steel . The development of the iron and steel industry; a recruiting film for the Iron & Steel Federation	Sd.	16 mm	33 mins.	G.B.E.
Production of High Quality Steel (1946)	Sd.	16 mm 35 mm	45 mins.	Hadfields
Repairing a Worn Dredger Bucket by Oxy-acetylene Welding	St.	16 mm	14 mins.	B.O.C.
Resistance Welding (1943). Detailed account of technique of welding, examples and causes of failure; different kinds of welding	Sd.	16 mm	60 mins.	M.O.S.
Roll Cap Roofing Zinc	St.	16 mm	20 mins.	Z.D.A.
Shorter Processes of Surface Hardening (1935). Photomicrographs and animated drawings; methods of application, with practical examples	St.	16 mm	32 mins.	B.O.C.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Silver. The manufacture of sterling flat-ware and hollow-ware, plated-ware, mirrors, uses of silver in photography	St.	16 mm	15 mins.	S.C.F.L. (A206)
The Silversmith. Comparison of the old trade with the new, and the manufacture of silver articles	Sd.	16 mm 35 mm	20 mins.	W.F.A.
Spinning (1941). Demonstrates both hand and machine spinning; the spinning lathe; tools and their manipulation. (Made in U.S.A.)	Sd.	16 mm	15 mins.	A.D.A.
Steel. From ore to finished product	St.	16 mm	10 mins.	S.C.F.L. (A344)
Steel. The making of steel in a British works; close-ups of furnaces, forges, rolling mills, machine shops, etc. In colour	Sd.	16 mm 35 mm	35 mins.	C.F.L.
Steel, Man's Servant	Sd.	16 mm	39 mins.	U.S. Steel
Steel Tank Construction (1935). Construction of a glass-lined tank, and fabricating a steel gas holder, by two different methods of welding	St.	16 mm	14 mins.	B.O.C.
Steel Town (1944). A report on modern methods of steel making in Youngstown, Ohio	Sd.	16 mm	16 mins.	C.F.L.
Steel, Wire and Nails	St.	16 mm	12 mins.	C.F.L.
Steelmaking (1946). Manufacture of high grade alloy steels in a Sheffield works; in Kodachrome	St.	16 mm	45 mins.	Firth Brown
The Story of A.C. Arc Welding (1944). In two parts, made by the G.E.C. of America in technicolour	Sd.	16 mm	20 mins. each part	M.O.S.
The Wonders of Tinplate —English title of <i>Magie du Fer Blanc</i> (q.v.)				
Tin. Tin mining and manufacture of tins at the factory	Sd.	16 mm 35 mm	10 mins.	W.F.A.
Tin. Mining tin ore; making tin plate; uses	St.	16 mm	15 mins.	S.C.F.L. (A50)
Tins for India. The manufacture of kerosene tins and the many uses to which they are put in rural India	Sd.	16 mm 35 mm	8 mins.	P.F.B.
Tube and Shape Bending (1941). Various methods described. (Made in U.S.A.)	Sd.	16 mm	13 mins.	A.D.A.
Wire Rope Making. Manufacture and uses	St.	16 mm	5 mins.	E.G.S. (L152)
Workington Acid Bessemer Steel Rails	St.	16 mm	15 mins.	U.S.C.
Workington Hematite Irons. (In colour)	St.	16 mm	15 mins.	U.S.C.

MINING

Anthracite Coal. Necessity for adequate timbering; miners at work; cleaning and grading coal	St.	16 mm	15 mins.	S.C.F.L. (A499)
Arc Wall Mining (1935). Parts 1 and 2. The use of arc wall cutters underground		16 mm	30 mins. each part	S.M.R.B.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Bituminous Coal. Miners at work ; air purification ; coal processing	St.	16 mm	1 reel	R. W. Proffitt
Buried Treasure (1939). The lay-out of a modern coal-pit, and the work performed by each kind of mine-worker in the different shifts (Ashington Colliery, Northumberland). <i>See also The Story of Coal</i> (silent version). There is a condensed version called <i>Black Gold</i> (21 mins.)	Sd.	35 mm 16 mm	35 mins.	C.F.L. (UK100) also C.U.J.C.
Coal (c. 1939). Mining methods in the U.S.S.R. with emphasis on mechanisation ; English commentary	Sd.	16 mm 35 mm	10 mins.	Sov.F.A. and W.F.A.
Coal. The nature of coal, how it is mined ; geological formation ; a modern coal face ; operations above and below ground ; safety precautions	St.	16 mm	20 mins.	S.C.F.L. (A490/2)
Coal Dust Explosion (1932). The crushing of coals received from collieries, the laying of the coal dust in an underground roadway, and explosion from the dust		16 mm	15 mins.	S.M.R.B.
Ground Movements (1931). A study (in diagrams) of breaks in advance of the coal face as the coal is worked		16 mm	13 mins.	S.M.R.B.
Machine Under-Cutting (1932). Turning the machine, jibbing in and cutting along the face		16 mm	15 mins.	S.M.R.B.
Mechanised Mining (1945) :				
1. Meco-Moore Cutter Loader	Sd.	16 mm 35 mm	19 mins.	C.F.L. (UK705/1)
2. Meco-Moore Cutter Loader	St.	16 mm	22 mins.	C.F.L. (UK705/2)
3. Joy Loader and Shuttlecar	Sd.	16 mm 35 mm	17 mins.	C.F.L. (UK705/3)
4. Joy Loader and Shuttlecar	St.	16 mm	13 mins.	C.F.L. (UK705/4)
5. Duckbill Loader	Sd.	16 mm 35 mm	18 mins.	C.F.L. (UK705/5)
6. Duckbill Loader The silent versions are intended for mining engineers addressing a specialised audience, the sound version for more general use. Produced by the Ministry of Fuel and Power	St.	16 mm	20 mins.	C.F.L. (UK705/6)
New Mine (1944). Modern planning and equipment in a coal-mine at Comrie, Scotland	Sd.	16 mm 35 mm	16 mins.	C.F.L. (UK597)
Packing (1932). The building of stone packs in mining		16 mm	15 mins.	S.M.R.B.
Planned Electrification (1938). Conversion of pithead gear of a coal-mine from steam to electrical working—the engineering side of coal-mines	Sd.	16 mm 35 mm	30 mins.	Metro-Vick Sound Services
Protective Equipment (1937). In mining and other industries		16 mm	18 mins.	S.M.R.B.
Roadheads (1939). The method of using girders as a roof support at or near ripping face in the mine		16 mm	15 mins.	S.M.R.B.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Sand Clay Stemming (1931). Efficiency of sand and clay mixture for shotfiring	St.	16 mm	15 mins.	S.M.R.B.
Shotfiring (1936). Use of mining explosives in accordance with the coal mining regulations	St.	16 mm	15 mins.	S.M.R.B.
The Story of Coal (1939). Coal mining in a modern mechanised pit. See also <i>Buried Treasure</i> , of which this is a silent version	St.	16 mm	30 mins.	C.F.L. (UK116)
Suppression of Airborne Dust by the use of Water (1945). Parts 1 and 2. Three methods of using water at the coal face: spraying, water infusion and wet cutting		16 mm	30 mins. each part	S.M.R.B.
Testing of Flameproof Electrical Equipment (1937). Routine test at Home Office Testing Station (Buxton) for electrical equipment for use underground		16 mm	15 mins.	S.M.R.B.
Training for Mechanised Mining (1945). A six months' course at the Sheffield Training Centre	Sd.	16 mm 35 mm	26 mins.	C.F.L. (UK705)
Treatment of Steel Supports (1935). Methods of straightening supports which have been distorted in use underground		16 mm	15 mins.	S.M.R.B.

OIL AND PETROLEUM

A.B.C. of Oil (1938). Discovery and drilling of oil-fields; crude oil and its products such as kerosene and petrol	Sd. & St.	16 mm 35 mm	10 mins.	P.F.B.
Distillation . General principles and laboratory work with special reference to the refining of petroleum; with models and moving diagrams	Sd.	16 mm 35 mm	15 mins.	P.F.B.
Distillation of Petroleum . See also <i>Distillation and Principles of Distillation</i>	St.	16 mm 35 mm	8 mins.	P.F.B.
Drilling for Oil . See <i>Operations of the Anglo-Iranian Oil Company</i>				
Exploring for Oil . See <i>Operations of the Anglo-Iranian Oil Company</i>				
Modern Spirit (1937). The story of petroleum production in Trinidad, from drilling a new well to the export of oil to Britain	Sd.	16 mm	16 mins.	C.F.L. (CE210)
Oil . An analysis of geological formation of oil in the West Indies, shown in animated diagrams; how a well is drilled	Sd. & Mute	16 mm 35 mm	10 mins.	G.B.E. (F703)
Oil Fires . Treatment of all types of fires associated with oil	Sd.	16 mm		Assoc. Ethyl
Oil from the Earth (1937). Work of the geologist, the prospector, shown by diagrams and models; construction of a pipe-line; refinery; distribution. See also <i>Production of Oil</i>	Sd.	16 mm 35 mm	18 mins.	P.F.B.

Title	Sound(<i>Sd.</i>) Silent(<i>St.</i>) or Mute	Size	Length	Distributors
Oil from Iran (1937). The present century's work of the petroleum industry in Iran, with some little-known facts on methods and processes	St.	16 mm 35 mm	13 mins.	P.F.B.
Operations of the Anglo-Iranian Oil Company in Iran (1938). In 4 parts.				
1. Exploring for Oil (1938)	Sd.	16 mm 35 mm	13 mins.	P.F.B.
2. Drilling for Oil (1938)	Sd.	16 mm 35 mm	24 mins.	P.F.B.
3. Pipeline and Crude Oil Storage (1938)	Sd.	16 mm 35 mm	8 mins.	P.F.B.
4. The Refining of Oil (1936) The four films give a comprehensive picture of the many processes connected with the operations of the Anglo-Iranian Oil Company in south Persia. Each can be shown separately	Sd.	16 mm 35 mm	24 mins.	P.F.B.
Paraffin Young (1937). A general approach to the story of the shale oil industry in Scotland established by James Young	Sd.	16 mm 35 mm	14 mins.	P.F.B.
	St.	16 mm		P.F.B.
Petroleum. Trinidad is the setting for a film on all the processes used in drilling a well; refining, transport, and uses	Sd. & Mute	16 mm 35 mm	20 mins.	G.B.E. (F797)
Pipeline (1942). The laying of an oil pipeline, from Texas to New Jersey. The research and techniques used in its construction	Sd.	16 mm 35 mm	8 mins.	C.F.L. (US210)
The Pipeline and Crude Oil Storage (1938). See <i>Operations of the Anglo-Iranian Oil Company</i>				
Principles of Distillation. This, together with <i>Distillation of Petroleum</i> , forms the silent version of <i>Distillation (q.v.)</i>	St.	16 mm 35 mm	8 mins.	P.F.B.
The Production of Oil. See also <i>Oil from the Earth</i> , of which this is the silent version	St.	16 mm 35 mm	20 mins.	P.F.B.
Refining Crude Oil. Petrol, kerosene, paraffin, lubricating oil, cracking fuel oil, asphalt and coke	St.	16 mm	15 mins.	S.C.F.L. (A22)
The Refining of Oil (1936). For more advanced audiences than <i>Distillation (q.v.)</i> ; see also <i>Operations of the Anglo-Iranian Oil Company</i>	Sd.	16 mm 35 mm	24 mins.	P.F.B.

PAINTS, OILS AND VARNISHES

The Discovery of a New Pigment (1943). The discovery of the phthalocyanines, told in detail; in colour	Sd.	16 mm	35 mins.	I.C.I. (Dye-stuffs). Only 2 copies available
The Film of Paint (1938). The preparation of white lead, the mixing of paints, and final processes for marketing	Sd.	16 mm 35 mm	40 mins.	L.I.D.C.
	St.	16 mm	70 mins.	L.I.D.C.
Indian Lac (pre-1939). Its production and manufacture	St.	16 mm	25 mins.	C.F.L. (IN372)

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
This is Colour, see under Textiles and Allied Processes				

RUBBER *

Dunlop Tyres. Their manufacture from the raw materials and the tests applied to the finished tyres	Sd.	16 mm	10 mins.	E.G.S. (S290)
Indian Rubber (1944). The growing of rubber (in India) and the manufacture of tyres; for general audiences	Sd.	16 mm 35 mm	11 mins.	C.F.L. (IN212)
The Preparation of Plantation Rubber	St.	16 mm	35 mins.	C.F.L. & Heaton
Prescription for Rubber (1944). Synthetic rubber manufacture in Ontario	Sd.	16 mm 35 mm	8 mins.	C.F.L. (C234)
Rubber. Production of crude rubber; compounding rubber; soft and hard rubber	St.	16 mm	15 mins.	S.C.F.L. (A17)
Rubber (1939). How it is grown, collected and prepared; with a printed lecture for each version	St.	16 mm	45 mins. (shorter version, 30 mins.)	C.F.L. B.R.D.B.
Rubber for the Road (pre-1939). How a car tyre is made	St.	16 mm	16 mins.	C.F.L. (UK38)

PAPER AND PRINTING

From Tree to Newspaper. Felled trees, pulp mills, paper manufacture, distribution to industries	St.	16 mm	15 mins.	S.C.F.L. (A57)
Printing and Bookbinding. The manufacture of paper, editing a MS, hand and machine composition, electro-typing of text, half-tone illustrations	St.	16 mm	15 mins.	S.C.F.L. (A527)
Wood Pulp. Manufacture of pulp and paper	St.	16 mm	1 reel	R. W. Proffitt

TEXTILES AND ALLIED PROCESSES

Border Weave (1941). Border woollen cloth, weaving processes shown in detail. Technicolour	Sd.	16 mm 35 mm	16 mins.	G.B.E.
Carpets (1938). Their manufacture at Templeton's factory, Glasgow	St.	16 mm	15 mins.	S.C.F.L. (C31)
Cotton Cloth. How the cotton is picked, transported and converted into yarn, etc.	St.	16 mm	10 mins.	G.B.E. (FS746)
Dundee (Jute)	Sd.	35 mm	19 mins.	A.B.F.D.
Flax (1943). The harvesting, spinning and uses of flax grown in Northern Ireland, showing both old and new methods	Sd.	16 mm 35 mm	10 mins.	C.F.L. (UK530)
From Flax to Linen. The making and spinning of line flax, weaving and finishing	St.	16 mm	15 mins.	S.C.F.L. (A20)

* The Research Association of British Rubber Manufacturers has a collection of over a thousand lantern slides relating to the rubber industry. For the address, etc. of the Association, see pages 292 (Directory) and 202-3 (Statement)

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
From Fleece to Woollens. Weaving by hand looms, and in the power mill; tweed manufacture; many uses of wool	St.	16 mm	10 mins.	S.C.F.L. (A109)
From Silkworm to Parachute (1943). The silk industry in India	Sd.	16 mm 35 mm	12 mins.	C.F.L. (IN216)
Hornespun. Cleaning and drying of wool; teasing, carding and spinning	St.	16 mm	5 mins.	E.G.S. (L138)
Merely the Trimmings (1945). History and operations of the silk industry (trimmings). Shows the extent of the Derby textile industry. In Kodachrome	Sd.	16 mm	42 mins.	C. Dould
Rope. Processes in a rope-making factory	St.	16 mm	5 mins.	E.G.S. (L146)
Shirlacrol	St.	16 mm	22 mins.	D.S.I.R.
Sisal (1945). Planting and cultivating, Tanganyika	Sd.	16 mm 35 mm	10 mins.	C.F.L. C.O.I. (CE213)
Textiles. Sources of raw materials, centres of Scottish textile industry, manufacture of tweed, linen, cotton, etc.	St. Sd.	16 mm 16 mm 35 mm	10 mins. 10 mins.	S.C.F.L. G.B.E. (A157) (F679)
There's a Future in It (1945). Produced by the Cotton Board; on the training for skilled jobs in the cotton trade	Sd.	16 mm 35 mm	20 mins.	C.F.L. (UK744)
This Is Colour (1943). Meaning and uses of colour; development of modern synthetic dyes; research	Sd.	16 mm 35 mm	15 mins.	I.C.I. C.F.L. (UK115)
Weaving. Each step in weaving, from the simplest form to the complex power loom of the modern factory	St.	16 mm	5 mins.	E.G.S. (L137)
Wool Mill. Washing and sorting of the rough fleeces; teasing, carding, spinning, weaving	St.	16 mm	5 mins.	E.G.S. (L132)
Woollen Goods. Sources of material; methods of manufacture	St.	16 mm	1 reel	R. W. Proffitt

TIMBER

Abrasive Test on Wooden Floors	St.	16 mm	13 mins.	D.S.I.R.
Big Timber (pre-1939). Timber operations from the felling of a tree to the making of planks for export	Sd.	16 mm	10 mins.	C.F.L. (C183)
Box-Making in Scotland, or From Forest to Factory	St.	35 mm	17 mins.	A & G. Paterson
Dry Rot	St.	16 mm	8 mins.	D.S.I.R.
Forest to Factory (1939). Modern methods of box-making, including automatic nailing machines; finished boxes and their uses	St.	16 mm	30 mins.	T.D.A.
Forest Treasures (1936). Manufacture of veneers and plywood; utilisation of veneers; inlays; carvings. (Made in U.S.A.)	Sd.	16 mm	20 mins.	T.D.A.
Horsa Components (1944). Manufacture of components for wooden Horsa glider; modern machinery and pattern moulds. (Sequel to <i>Oxford Fuselages</i>)	St.	16 mm	25 mins.	T.D.A.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Oxford Fuselages (1944). Testing of timber for aircraft; conversion of timber into standardised sizes and shapes; glueing and moulding plywood and laminated wood; assembly on mass-production lines for wooden aircraft fuselage production	St.	16 mm	25 mins.	T.D.A.
Ply in the Sky (1943). Mosquito aircraft in the making and in action	Sd.	16 mm	5 mins.	T.D.A.
Plywood Invades Europe (1943). Manufacture of plywood and use in aircraft and assault craft	Sd.	16 mm	10 mins.	T.D.A.
Seasoning Timber	St.	16 mm	10 mins.	D.S.I.R.
The Story of Timber (1939). Part 1: Distribution, Felling and Transport. Part 2: Conversion and Uses. Made in collaboration with the Timber Development Association	St.	16 mm	15 mins. each part	D.H.
Tomorrow's Timber (1944). Canada's lumber industry and timber preservation; part of the film deals with scientific applications in rayons, plastics, etc.; in Kodachrome	Sd.	16 mm	18 mins.	N.F.B.C.
Tree in a Test Tube (1942). Forest Products Laboratory, Madison, Wisconsin, where new uses for wood are developed and tested. (U.S.A. Office of Education). In colour	Sd.	16 mm	10 mins.	T.D.A.
Trees that Reach the Sky (1945). Felling and cutting in Western Canada; preparation and inspection of plywood for aircraft	Sd.	16 mm	8 mins.	N.F.B.C.
Woodworking	Sd.	16 mm	12 mins.	D.S.I.R.

WATER AND WATER ENGINEERING

The Filter. The elimination of bacteria from water supplies; methods of filtration	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F559)
Water (1943). Chemists study the constituents of water and its solids, such as calcium	Sd.	16 mm 35 mm	11 mins.	C.F.L. (UK113)
Water Cycle (1943). The cycle of the evaporation and precipitation of water	Sd.	16 mm 35 mm	11 mins.	C.F.L. (UK114))
Water Power. The use of hydro-electric power; damming a loch; generating station; distribution of the current	Sd.	16 mm 35 mm	10 mins.	G.B.E. (F640)
Water Service (1945). Scientific methods of collection, storage, purification, distribution. Produced by the British Council	Sd.	16 mm 35 mm	11 mins.	C.F.L. (UK745)

WELDING, see METALS

MISCELLANEOUS

Autoclaves	St.	16 mm	13 mins.	D.S.I.R.
Britain Can Make It : No. 8 (c. 1946). Jobs of a harbour tug; scientific egg-packing; production of mine-drilling equipment in Cornwall	Sd.	16 mm 35 mm	10 mins.	C.F.L. (UK828)

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Britain Can Make It : No. 9 (c. 1946). British production of agricultural machinery; machinery for precision testing; new electrical domestic equipment	Sd.	16 mm 35 mm	10 mins.	C.F.L. (UK829)
Britain Can Make It : No. 10 (c. 1946). A new type of folding-boat; British clock production; an under-sea repeater station; making porous glass filters	Sd.	16 mm 35 mm	11 mins.	C.F.L. (UK830)
Damage Control (c. 1943). The chemistry of fire	Sd.	16 mm	44 mins.	C.F.L. (NFS23)
Face of Time (1942). A geological survey, showing the vast mineral resources of Canada. (Kodachrome)	Sd.	16 mm 35 mm	20 mins.	N.F.B.C.
Cereal Seed Disinfection (1943). Preventive measures by the use of organo-mercury against infective agents of wheat, barley and oats; types of seed-dresser	Sd.	16 mm 35 mm	12 mins.	C.F.L. (UK430)
Cocoanuts in Ceylon (c. 1939). Picking, converting into twine, desiccated cocoanut, etc.	St.	16 mm	8 mins.	C.F.L. (CE333)
The Fur Trade (1946). An outline of fur trapping in Canada; modern trading methods; processing of pelts; reference to scientific breeding	Sd.	16 mm	11 mins.	N.F.B.C.
Handle with Care (1945). Precautions in a munitions factory; the industrial chemist at work; changing wood pulp into explosives; the later stages of munitions manufacture	Sd.	16 mm	18 mins.	N.F.B.C. C.F.L. (C216)
History of the Pen. An historical survey of the development of the pen; details in manufacture of a fountain pen. (Mabie Todd & Co.)	St.	16 mm	70 mins.	E.G.S. (L154)
It Comes from Coal (1940). A film of general interest on coal as a source of chemical wealth; shots of a laboratory where M & B 693 was discovered	Sd.	16 mm 35 mm	12 mins.	C.F.L. & B.G.C. (UK260)
	St.	16 mm		
Leather. Tanning methods, making of shoes by hand, and by modern machinery	St.	16 mm	15 mins.	S.C.F.L. (A19)
Lime. How it is obtained, and the necessary treatments for the purpose for which it is required	St.	16 mm	8 mins.	S.C.F.L. (A237)
Lime (1945). Scientific implications of the use of lime on soil	Sd.	16 mm 35 mm	11 mins.	C.F.L. (UK712) I.C.I.
Liquid Air. See <i>Two Discoveries</i>				
Manufacture of Beetle	St.	16 mm	30 mins.	Beetle Prod.
Material of Infinite Uses (Bakelite)	Sd.	16 mm 35 mm	25 mins.	Bakelite
	Sd.	16 mm 35 mm	8 mins.	N.F.B.C.
Music in the Wind (1945). The craft of the organ builder; stages in the construction of a modern organ in a famous workshop in Quebec	Sd.	16 mm 35 mm	8 mins.	N.F.B.C.
A P.F.B. Magazine : No. 4. Clearing scrub in Australia; the oxy-propane flame in cutting metal; changing a railway bridge at night	Sd.	16 mm 35 mm	10 mins.	P.F.B.

<i>Title</i>	<i>Sound(Sd.) Silent(St.) or Mute</i>	<i>Size</i>	<i>Length</i>	<i>Distributors</i>
Power Valley (1946). Development of the resources of the St. Maurice River valley through electricity, which provides power to the factories and mills for the manufacture of aluminium products, paper and pulp, plastics, etc.	Sd.	35 mm	17 mins.	N.F.B.C.
The Production and Distribution of Medical Gases (1938). Workings of the British Oxygen Company's factory; a hospital sequence; uses in dentistry, and for midwives	St.	16 mm	20 mins.	B.O.C.
Salt from the Earth (1944). The mining and processing of salt in Nova Scotia; a survey of its many uses. Suitable for school and general use	Sd.	16 mm	10 mins.	N.F.B.C.
Soil Nutrients (1945). Benefits of nitrates, potash and phosphates to the soil; dunging; soil analysis; application of fertilisers		16 mm 35 mm	20 mins.	C.F.L. (UK713)
Soap . Methods of making home-made and factory soap; action of soap in hard and soft water	St.	16 mm	15 mins.	S.C.F.L. (A568)
Soap Making . A general film on the operations in the making of soap	St.	16 mm	8 mins.	S.C.F.L. (A235)
Solvent Extractor	St.	16 mm	11 mins.	D.S.I.R.
The Story of D.D.T. (1945). The uses of D.D.T. as an insecticide in the war. A scientific approach, with laboratory testing and field trials. Produced by the War Office	Sd.	16 mm 35 mm	23 mins.	C.F.L. (V238)
Tobacco Raising in Quebec (1941). How the farms apply results of a Government Experimental Station in the growing of tobacco	Sd.	16 mm	6 mins.	N.F.B.C.
Two Discoveries (U.S.S.R.) (1940). Part 2: Liquid Air. The applications of oxygen; Kopitsa machine for making liquid air described	Sd. Sd.	16 mm 35 mm	10 mins.	W.F.A. Sov.F.A.
What's the Time . The manufacture of clocks	Sd.	35 mm	20 mins.	Paramount
The World of Sound (1944). Structure of the ear, testing of hearing, aids for the deaf	Sd.	35 mm	9 mins.	Columbia

DISTRIBUTORS

Aircscrew—Aircscrew Co., Ltd., Weybridge, Hants.

A.D.A.—Aluminium Development Association, 33, Grosvenor Street, London, W.1.

Anglo-American—Anglo-American Film Corp., 123-125, Wardour Street, London, W.1.

Armstrong Vickers—Armstrong Vickers, Ltd., Vickers House, Broadway, London, S.W.1.

A.B.F.D.—Associated British Film Distributors, Ltd., 169, Oxford Street, London, W.1.

Assoc. Ethyl—Associated Ethyl Co., Ltd., Artillery House, Artillery Row, London, S.W.1.

Austin—Austin Motor Co., Ltd., Longbridge, nr. Birmingham.

A.N.I.B.—Australian News and Information Bureau, Australia House, Strand, London, W.C.

- Bakelite—Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1.
 Beardmore—William Beardmore & Co., Ltd., Parkhead Steel Works, Glasgow, E.1.
 Beetle—Beetle Products Co., Ltd., Oldbury, Worcs.
 B.F.I.—British Film Institute, 4, Great Russell Street, London, W.C.1.
 B.G.C.—British Gas Council, 1, Grosvenor Place, London, S.W.1.
 B.I.F.—British Instructional Films, Ltd., 111, Wardour Street, London, W.1.
 B.I.S.F.—British Iron & Steel Federation, 11, Tothill Street, London, S.W.1.
 B.O.C.—British Oxygen Co., Ltd., North Circular Road, Cricklewood, London, N.W.2.
 B.R.D.B.—British Rubber Development Board, 19, Fenchurch Street, London, E.C.3.
 B.T.H.—British Thomson-Houston Co., Ltd., Rugby.
 Cadbury—Cadbury's, Ltd., Bournville.
 C.F.L.—Central Film Library, Imperial Institute, London, S.W.7.
 C.O.I.—Central Office of Information (Films Division), Norgeby House, Baker Street, London, W.1.
 C.U.J.C.—Coal Utilisation Joint Council, 54, Victoria Street, London, S.W.1.
 Columbia—Columbia Pictures, 139, Wardour Street, London, W.1.
 D.H.—Dartington Hall Film Unit, Totnes, South Devon.
 Dould—C. Dould & Son, Derby.
 D.S.I.R.—Department of Scientific and Industrial Research, 24, Rutland Gate, London, S.W.7.
 Dorman Long—Dorman, Long & Co., Terminal House, Grosvenor Gardens, London, S.W.1.
 Edgar Allen—Edgar Allen & Co., Ltd., Sheffield, Yorks.
 Edison Swan—Edison Swan Electric Co., 130, King Street, Twickenham.
 E.F.B.—Educational Films Bureau, 5, Walton Terrace, Aylesbury, Bucks.
 E.G.S.—Educational & General Services, Tower House, Woodchester, Stroud, Glos.
 Fairthorne—R. A. Fairthorne, Kirk Michael, Hillfield Road, Farnborough, Hants.
 Film Library of the South West—see D.H.
 Firth Brown—Thomas Firth & John Brown, Ltd., Atlas and Norfolk Works, Sheffield, 1.
 Ford—Ford Film Library, Ford Works, Dagenham.
 F.F.D.—French Film Delegation, 27, Queen Anne Street, London, W.1.
 F.O.I.—French Office of Information, 54, Queen Anne's Gate, London, S.W.1.
 G.B.E.—Gaumont-British Equipments, 21, Soho Square, London, W.1.
 G.K.N.—Guest, Keen & Nettlefolds, Ltd., Box No. 24, Heath Street, Birmingham, 18.
 Hadfields—Messrs. Hadfields, Ltd., East Hecla Works, Sheffield, 9.
 Heaton—Wallace Heaton, 127, New Bond Street, London, W.1.
 H.D.A.—High Duty Alloys, Ltd., Slough, Bucks.
 I.C.I.—Imperial Chemical Industries, Ltd., Dyestuffs Division, Hexagon House, Blackley, Manchester, 9.
 I.B.F.—Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, 3.
 Inst.C.E.—Institution of Civil Engineers, Great George Street, London, S.W.1.
 K.M.L.—Kodak Medical Library, c/o Royal Society of Medicine, Wimpole Street, London, W.1.
 Leyland—Leyland Motors, Ltd., 14, Hanover Square, London, W.1.
 L.I.D.C.—Lead Industries Development Council, Limpsfield Court, Oxted, Surrey.
 Lincoln—Lincoln Electric Co., Ltd., Welwyn Garden City, Herts.
 Lucas—Joseph Lucas, Ltd., Great King Street, Birmingham.
 Marine Instruments—Marine Instruments Ltd. (Publicity), Huson Works, New North Road, Ilford, Essex.
 Marples—Marples & Sons, Ltd., 44, Upper Thames Street, London, E.C.4.
 M.G.M.—Metro Goldwyn Mayer Pictures, Ltd., 19, Tower Street, London, W.C.2.
 Metro-Vick—Metropolitan Vickers, Ltd., Trafford Park, Manchester.
 Microchemical Club, c/o National Physical Laboratory, Teddington.
 M.O.S.—Ministry of Supply (Advisory Service on Welding), Shell Mex House, Strand, London, W.C.2.
 Morris—Morris Motors, Ltd., Cowley.
 Murex—Murex Welding Processes, Ltd., Hertford Road, Waltham Cross.
 Nat. Alloys—National Alloys, Ltd., 95, Gresham Street, London, E.C.2.

- N.A.M.M.C.—National Asphalt Mineowners and Manufacturers Council, 94, Petty France, London, S.W.1.
 N.F.B.C.—National Film Board of Canada, 8-9, Long Acre, London, W.C.2.
 Paramount—Paramount Film Service, 166, Wardour Street, London, W.1.
 Paterson—A. G. Paterson, 68, Tennah Street, Glasgow.
 P.F.B.—Petroleum Films Bureau, 46, St. James's Place, St. James's Street, London, S.W.1.
 Pilkington—Pilkington Bros., St. Helens, Lancs.
 Powell—J. Powell & Sons (Whitefriars) Ltd., Whitefriars Glass Works, Tudor Road, Wealdstone.
 Proffitt—R. W. Proffitt, Ltd., 49-51, Knowsley Street, Bolton.
 Radio—Radio Pictures, Ltd., 2, Dean Street, London, W.1.
 Realist F.U.—Realist Film Unit, Great Chapel Street Chambers, London, W.1.
 R.A.S.—Royal Aeronautical Society, 4, Hamilton Place, London, W.1.
 S.M.R.B.—Safety in Mines Research Board, Portobello Street, Sheffield, 1. (N.B. These films available only to those within the mining industry, industrial or educational.)
 S.C.F.L.—Scottish Central Film Library, 2, Newton Place, Charing Cross, Glasgow, C.3.
 S.F.A.—Scientific Film Association, 34, Soho Square, London, W.1.
 Sov.F.A.—Soviet Film Agency, 5, Kensington Palace Gardens, London, W.2.
 Stuart—Stuart & Sons, Ltd., 11, Charterhouse Street, London, E.C.1.
 T.D.A.—Timber Development Association, Film Library, 75, Cannon Street, London, E.C.4.
 T.R.I.—Tin Research Institute, Fraser Road, Greenford, Middlesex.
 20th Century Fox Film Co., 31, Soho Square, London, W.1.
 U.S.C.—United Steel Companies, 8, Grosvenor Gardens, London, S.W.1.
 Waygood-Otis—Waygood-Otis, Ltd., Falmouth Road, London, W.1.
 W.F.A.—Workers Film Association, Transport House, Smith Square, London, S.W.1.
 Wolf—Messrs. S. Wolf & Co., Ltd., Hanger-lane, Ealing, London, W.5.
 Yorkshire Copper Works, Ltd., 1, Upper Thames Street, London, E.C.4.
 Z.D.A.—Zinc Development Association, Lincoln House, Turl Street, Oxford.

Mobile units of the Central Office of Information (formerly Ministry of Information) are available to display, free of charge, the films distributed by C.F.L. Full particulars are obtainable from Regional Film Officers, a list of whom appears below. Application should be made well in advance, as the demand on these mobile units is heavy.

CENTRAL OFFICE OF INFORMATION REGIONAL FILM OFFICERS

Eastern Region

(Hunts., Cambs., Norfolk, Suffolk, Bedford, Herts. outside Greater London area, Essex outside Greater London area).

The Film Officer, Central Office of Information, Bene't Passage, Bene't Street Cambridge. (Telephone: Cambridge 55461).

London and South Eastern Region

(Greater London Area, Middlesex, Surrey, Sussex, Kent).

The Film Officer, 70, Victoria Street, London, S.W.1. (Telephone 8522).

Midland Region

(Staffs., Salop, Hereford, Worcs., Warwicks).

The Film Officer, Central Office of Information, Lombard House, Great Charles Street, Birmingham, 3. (Telephone: Central 7234/5).

Northern Region

(Northumberland, Durham, Cumberland, Westmorland, North Riding of Yorks).

The Film Officer, Central Office of Information, Metrovick House, Northumberland Road, Newcastle-upon-Tyne, 2. (Telephone: Newcastle 27351).

East and West Ridings Region

(Yorkshire, East and West Ridings of Yorks).

The Film Officer, Central Office of Information, 7, Wetherby Road, Leeds, 8. (Telephone: Leeds 58241).

North Midland Region

(Lincs., Notts., Derby., Leics., Northants., Rutland).

The Film Officer, Central Office of Information, Sherwood Buildings, South Sherwood Street, Nottingham. (Telephone: Nottingham 46221)

North Western Region

(Lancs., Cheshire, and High Peak Districts of Derbys.).

The Film Officer, Central Office of Information, 3, Cross Street, Manchester. (Telephone : Deansgate 2173).

Southern Region

(Dorset, Hants., and Channel Isles, Berks., Bucks., Oxford).

The Film Officer, Central Office of Information, The Governor's House, Forbury Road, Reading. (Telephone : Reading 60226).

South Western Region

(Cornwall, Devon, Somerset, Wilts., and Scilly Isles, Glos.)

The Film Officer, Central Office of Information, 15, Belgrave Road, Bristol, 8. (Telephone : Bristol 37026/7).

Wales

The Film Officer, Central Office of Information, 2, Cathedral Road, Cardiff. (Telephone : Cardiff 8245/6).

Scotland

The Film Officer, Central Office of Information, St. Andrew's House, Edinburgh, 1. (Telephone : Edinburgh 33433).

Northern Ireland

The Film Officer, Central Office of Information, Stormont Castle, Belfast. (Telephone : Belfast 63210).

Who's Who in Industrial Research

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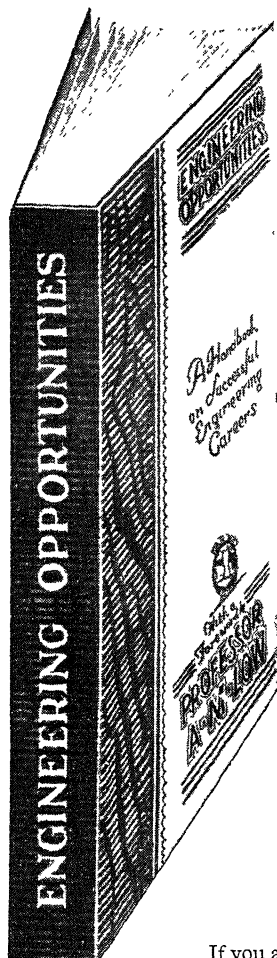
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